

1973

1973

William Stewart

Robert McIntyre


Samuel Pavadore

Gerald Moscato

David Clement

*See next page for additional authors*

Follow this and additional works at: [https://scholarworks.umass.edu/turf\\_clippings](https://scholarworks.umass.edu/turf_clippings)

 Part of the [Other Plant Sciences Commons](#), [Plant Biology Commons](#), [Plant Breeding and Genetics Commons](#), [Plant Pathology Commons](#), and the [Weed Science Commons](#)

---

Stewart, William; McIntyre, Robert; Pavadore, Samuel; Moscato, Gerald; Clement, David; Flaherty, Joseph R.; Rewinski, Thomas F.; Lucas, Melvin B. Jr.; Zontek, Stanley J.; Gallagher, John E.; Carrow, Robert N.; Buchanan, William G.; Jagschitz, John A.; Schery, Robert; Toma, George P.; Duell, Robert W.; Stolpe, Martin; Barauskas, Al; Moore, Sherwood A.; Hawtree, F. W.; and Cornish, Geoffrey S., "1973" (1973). *Turf Clippings*. 17.

Retrieved from [https://scholarworks.umass.edu/turf\\_clippings/17](https://scholarworks.umass.edu/turf_clippings/17)

This Article is brought to you for free and open access by the Turf Program at ScholarWorks@UMass Amherst. It has been accepted for inclusion in Turf Clippings by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact [scholarworks@library.umass.edu](mailto:scholarworks@library.umass.edu).

---

**Authors**

William Stewart, Robert McIntyre, Samuel Pavadore, Gerald Moscato, David Clement, Joseph R. Flaherty, Thomas F. Rewinski, Melvin B. Lucas Jr., Stanley J. Zontek, John E. Gallagher, Robert N. Carrow, William G. Buchanan, John A. Jagschitz, Robert Schery, George P. Toma, Robert W. Duell, Martin Stolpe, Al Barauskas, Sherwood A. Moore, F. W. Hawtree, and Geoffrey S. Cornish



**STOCKBRIDGE SCHOOL**

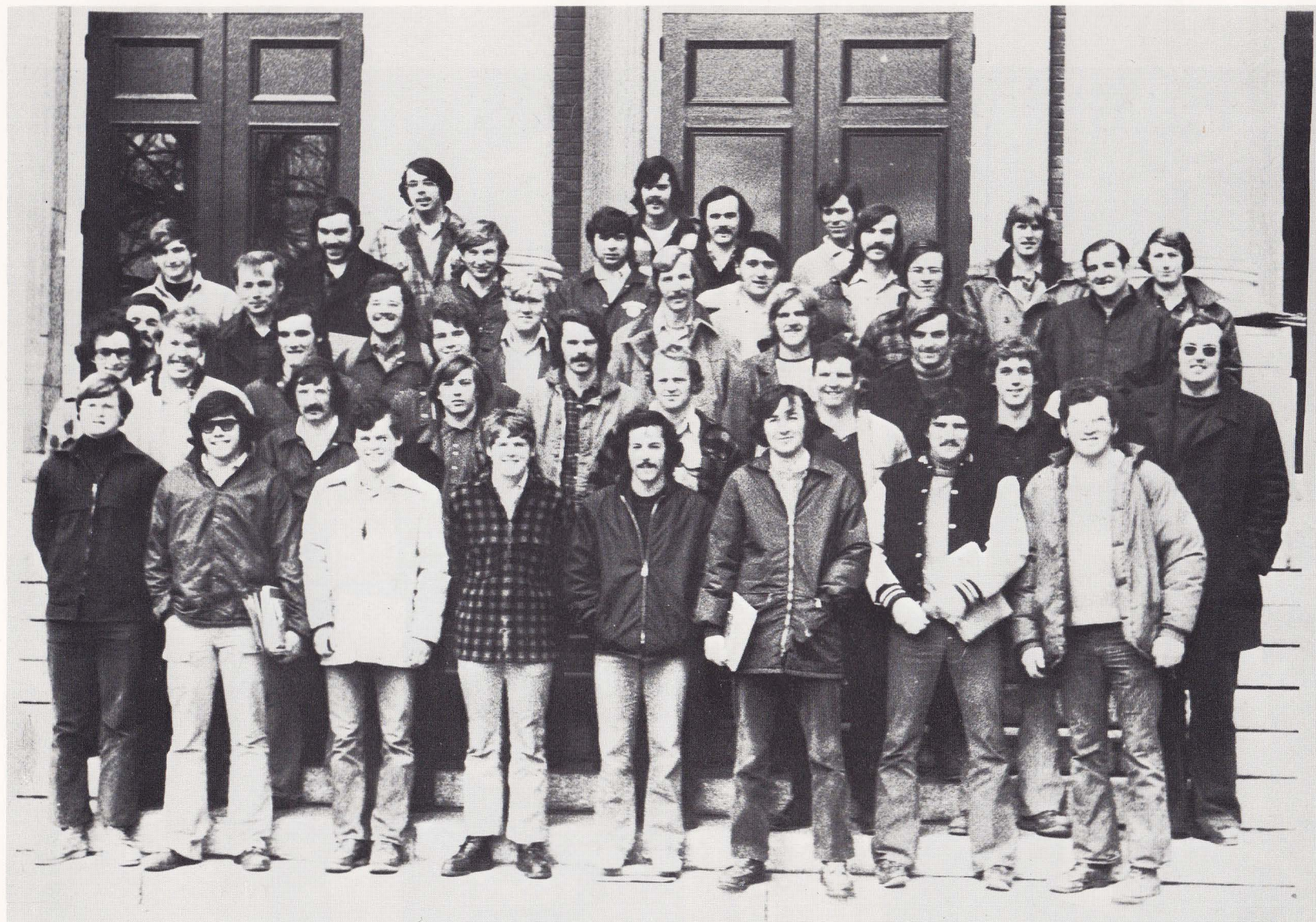
**TURF**

**CLIPPINGS**

**CONFERENCE PROCEEDINGS**







#### **TURF MANAGEMENT SENIORS**

**Row 1: [Left to Right]: L. Keefe, M. Conn, S. Robinson, S. Hoisington, B. Silva, P. Fontaine, L. Oliveira, J. Choquette**

**Row 2: P. DiRico, M. Jusczyk, R. Hamilton, G. Graham, M. Johnson, D. Geiger**

**Row 3: M. Huot, J. Schoonmaker, M. Pacheco, J. Leger, T. Feen, R. Carpenter, R. Belden**

**Row 4: E. Aurelio, J. Ferry, L. Sheiber, G. McNamara, G. Carlson, W. Lucier, F. Thomas**

**Row 5: M. Waterman, H. Shea, J. Sisko, M. Loati, T. Dresner**

**Row 6: P. O'Brien, D. O'Neil, T. McNally, D. Litterer, A. Smith, G. Mook, N. Methe**





**RECIPIENTS OF GOLF COURSE SUPERINTENDENTS  
ASSOCIATION OF AMERICA AWARDS**

**Left-Right: Charles Baskin, Vice President GCSAA, who presented the awards; Jerry Schoonmaker, Thomas Dzwilewski, Leslie Sheiber, Gregory Graham, Dr. Joseph Troll and Dr. Robert N. Carrow, Department of Plant and Soil Sciences**



**MR. WALTER LOWELL of the Connecticut Pro Golf Association presenting scholarship awards to: Left to Right: Mr. Lowell, Leslie Sheiber, Philip DiRico, John Ferry [all S'73]; and Allan Stegeman and Charles York, 1973 Winter School for Turf Managers; Dr. Joseph Troll and Dr. Robert Carrow, Plant and Soil Sciences.**



## TURF CLIPPINGS

Published by  
The Stockbridge Turf Management Club  
of the University of Massachusetts

---

To form a bond of common interest between the Turf Management Club, the alumni of the Stockbridge and Winter School Turf majors and all interested friends of the University of Massachusetts Turf Program.

---

---

Vol. 8. No. 1.	Turf Management Club Department of Plant and Soil Sciences University of Massachusetts Amherst, Massachusetts 01002	Editors Gregory Graham Jerry Schoonmaker Leslie Sheiber Advisor Dr. Joseph Troll
----------------	---	---

---

### Contents

Picture - Turf Management Seniors  
Picture - G.C.S.A.A. Scholarship Awards; Connecticut P.G.A.Scholarship Awards

#### Title Page and Contents

Skunks Shoot Back by William Stewart . . . . .	1
The Daily Plan: A Management Factor by Robert McIntyre . . . . .	2
Teed Off by Samuel Pavadore . . . . .	3
A Responsible Neighbor by Gerald R. Moscato . . . . .	4
Picture - F.W.Hawtree; and Donations to Mass. Golf Course Turf Research	
Picture - Winter School 1973	

#### Conference Proceedings - Table of Contents

\*\*\*\*\*

## SKUNKS SHOOT BACK

William Stewart  
Stockbridge '74

Through the rain drops the light beam centered on the form of the vandal. The shot rang out and it was over; a skunk lay dead on number two fairway. It was the Fall of 1971 and our golf course was plagued with skunks tearing the turf for the European Chafer grubs. The problem was getting out of hand. They could damage an enormous amount of turf in a single night. It was too late in the season to rid the course of the grub; we had to eliminate the skunk.

In Upstate New York a local skunk catcher doesn't exist. I had to find the best way to escort Mr. Black and White off the premises. A trap would work, but who would volunteer to remove the creature? Shooting it seemed to be the only alternative.

From previous observations I summarized that most of the damage occurred after midnight. So with gun in hand I set out to make my kill. This proved to be of little value. I didn't make one score!

With the course still vulnerable to the attack, I put plan two into effect, well almost. Word was passed to me from one of the old local farmers to put a "ripe" chicken on the fairway and the skunks being scavengers as they are would gather around it and make for easy game. The farmer forgot to relate the fact that the decaying bait smelled worse than the skunk. This was the end before the beginning of plan two.

Meanwhile back at the course number five fairway looked like the Battle of Gettysburg. This motivated me into plan three. With the aid of a golf cart and a driver I planned to run them down. This proved to be successful beyond my expectations. I bagged eleven skunks. The major problem with success is the cleanup. There was no way of killing one without that unfragrant odor, which would remain in the area for many days.

My advice for the potential skunk inhabited golf course is to apply a good chemical program to eliminate the Chafer. After all, the state conservation department would appreciate people not shooting their fur bearing animals. The skunk, stinker though he is, deserves the right to live; and you have the right to a good night's sleep!



## THE DAILY PLAN: A MANAGEMENT FACTOR

Robert McIntyre  
Stockbridge '74

There are many factors which a golf course superintendent must weigh, but one of the more important is that of the use of a daily plan. The daily plan is just a small part of the overall yearly program, which would include seasonal planning, monthly planning, weekly planning, and finally the daily plan. Why the necessity of a daily plan? It would be to the benefit of the superintendent to have on hand a plan which would use labor, equipment, and materials in the most efficient and effective manner, if for no other reason than cost and time. There are certain points to consider in formulating the daily plan:

1. Have an assistant or foreman with whom you can go over the planned activities for the day. It is important for someone other than the superintendent to be fully acquainted with the plans because in many instances work could be interrupted by visits from salesmen, club members, or the superintendent could be called away to a meeting, leaving no one knowing what to do next.

2. Plan daily maintenance so the work will least interfere with play. Jobs that may interfere with play can be performed when play is light.

3. Plan the work so larger operations can be started and completed in a reasonable amount of time. Don't have too many jobs going at one time so that it becomes difficult to finish any of them.

4. Be ever mindful of the weather. Listen to weather forecasts and plan accordingly. Have a "rainy day schedule" in case of inclement weather. A degree of flexibility is needed in a daily plan.

5. Place employees on jobs where their abilities and interests can be used to best advantage. Learn which jobs each employee prefers to do and use him there when possible. Give him an opportunity to expand his abilities; this could deter boredom and resentment among the crew. If possible, some time should be set aside for additional training and instruction.

6. Have an alternate daily plan. Work days may be interrupted by weather, equipment breakdown, or sickness of employees; therefore, the need for the alternate plan.

7. On daily jobs have a list of work items that you expect your employees to follow. Certain routine jobs are to be carried out in a particular way or method. The employee should know what is expected

of him and he will take pride in doing a good job.

8. Keep your employees informed. Give them as much information about your plans as possible and post club events which might affect their job performance. The more an employee knows about a golf course and its operation, the better his performance, and the more observant he becomes of his surroundings. This knowledge also raises the morale of the crew and gives them a feeling of better job security.

These are only a few points to be considered in a daily plan. I'm sure these points could be elaborated upon and maybe a few changes or additions made, for it would depend on each individual course and its budget to determine the degree and extent of a daily plan. To begin to operate a golf course in this day and age without some plan of continuity is indeed foolhardy from every aspect of management.

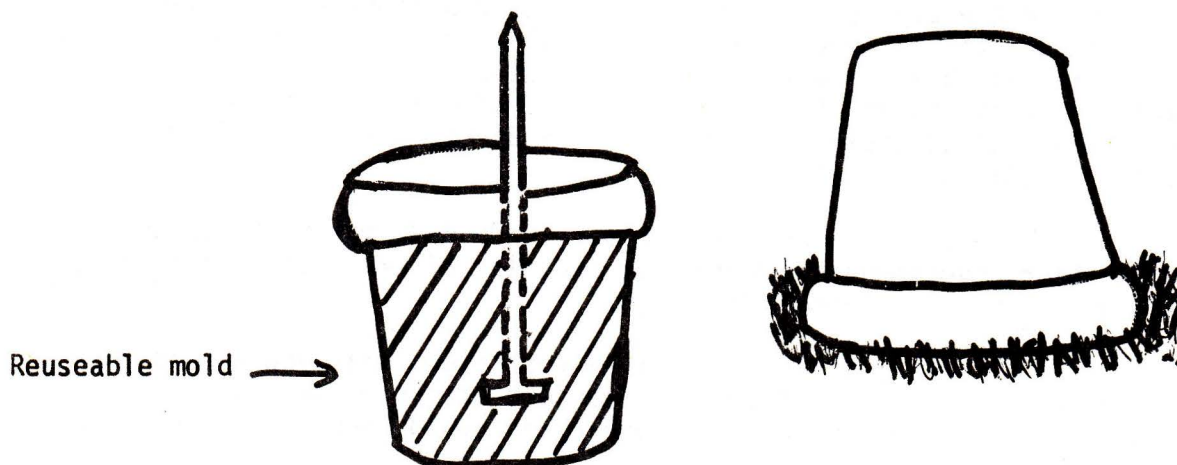
---

### TEED OFF

Samuel Pavadore  
Stockbridge '74

Do you often find your teemarkers scattered in the woods or ponds when you are changing cups? Teemarkers and flags are usually the main items on a young vandal's list. When you find these items either broken or stolen, you have to replace them fast before the golfers get out. Most superintendents keep an ample supply of them in their barn but both of these articles are very expensive. Every superintendent should tailor his budget to meet such emergencies.

A relatively inexpensive tee marker can be made out of these handy materials: a plastic flower pot, a little cement, a 6" spike and a little paint.





## A RESPONSIBLE NEIGHBOR

Gerald R. Moscato  
Stockbridge S'74

Americans today, whether they live in the inner city or suburbs, feel the effects of higher taxes, pollution and the onslaught of development. A golf course can help hold down rising taxes by withholding land from development, supplying recreational activities and helping to curtail the effects of pollution through the life process of turf and trees. Therefore, few demands will be made on municipalities for schools, recreational areas and environmental cleanup.

We can begin by examining the most abundant thing on any golf course ... green grass. Everything we eat, whether it be plant or animal begins with something green.

Through the process of photosynthesis, the only foodmaking process on earth, green plants convert light energy into chemical energy. During this process some of the atmosphere pollutants given off by the burning of fossil type fuel are absorbed and pure oxygen is emitted. Research in this area has proven that the average 18 hole golf course of approximately 150 acres generates enough oxygen to support 10,350 people per year.

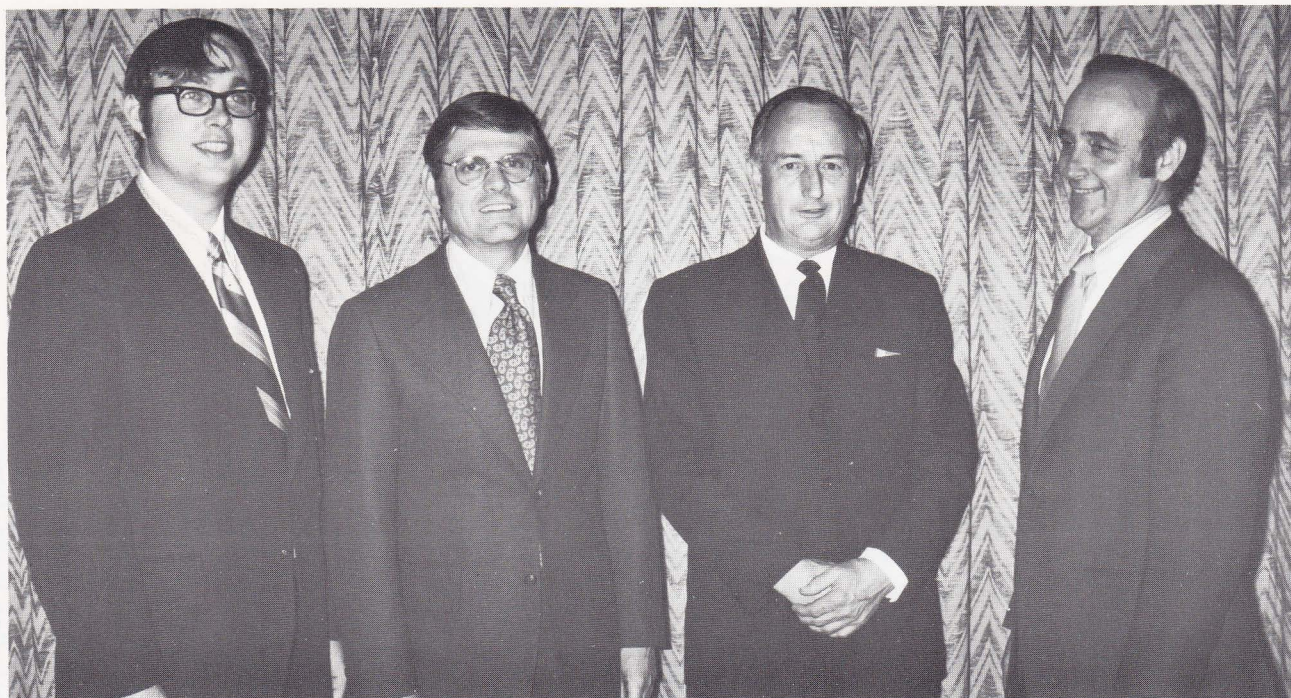
Trees, like grass, are essential to the game of golf but are of particular importance to the atmosphere. Aside from being green and carrying on photosynthesis, the static electricity given off by the leaves attracts and holds millions of tons of dust per year. The dust is trapped until the next rainfall, where it is washed to the earth's surface and incorporated into the soil matter. Trees literally sweep the atmosphere!

Soils not only collect the dust held by trees after a good rainfall but absorb carbon monoxide, sulfur dioxide and ozone, all of which are atmospheric pollutants caused by our highly mechanized and industrialized society. For the city dweller this is important because of the high concentration of automobiles, trucks and factories within the city.

Noise pollution cannot be overlooked, especially for people living within the inner city. Unlike the pollution mentioned above, noise effects people as soon as it occurs. Turf, trees and the soil that support them absorb noise and act as a barrier between it and the population it effects, hence making our inner cities a bit more habitable.

For many years golf courses were looked upon as a means of recreation for those who partook of the sport. In the 20th century America, where a million acres of land per year are being developed or paved over for highways, we must not only evaluate a golf course for the recreational activity it provides but also for the fact that it can be a responsible member of the community in which it exists.





**ONE OF THE FEATURED SPEAKERS AT THE ANNUAL FINE TURF CONFERENCE, MR. F. W. HAWTREE, BRITISH GOLF COURSE ARCHITECT**  
**Left-Right: Dr. Robert Carrow, Plant and Soil Sciences; Dr. Donald Maynard, Acting Head, Plant and Soil Sciences; Mr. Hawtree; and Dr. Joseph Troll, Plant and Soil Sciences**



**PRESENTATION OF CONTRIBUTIONS TO THE MASSACHUSETTS  
 GOLF COURSE TURF RESEARCH FUND**

**Left to Right: Dr. Robert Carrow, Plant and Soil Sciences; Dr. Donald Maynard, Acting Head, Plant and Soil Sciences; Dr. Joseph Troll, Plant and Soil Sciences; Mr. Melvin Lucas representing the Long Island GCSA and Mr. Paul O'Leary representing the Northeast GCSA who presented donations from their associations.**





#### **1973 WINTER TURF SCHOOL**

**L. to R.—Top Row—Mark Taylor, Mark Willmore, Pat Wallrich, Ron Van Cleave, Walt Ragoza, Roger Pereira**

**Row 4—Prof. J. M. Zak, Rich Guiffredo, Steve Bigoness, Charles York, Frank Winngate, Frank Donohue, John Howard, Wm. Risch**

**Row 3—J. Beaupre, John Lango, Bill Fitzgerald, Ed Picard, Bob Cunningham, Don Reetz, Dr. R. Carrow, Dahn Tibbett, J.C. Tremblai**

**Row 2—Bruce Wolf, Leonard Lisewaky, Mark Stumpf, Jim Corcorn, Bill Sherry, Don Gallies, Bob Killilea, Ted Pepping, Robert Williams, Alan Levenson**

**Row 1—Dennis Spencer, Nick Ryck, Gabe Scalise, Michael McNerny, Dan Irwin, Jerry Delsesto, Wilfred Borland, Ed Correia, Allan Stegeman, J.M. Cote, Dr. Joseph Troll**

**Not present for picture—Scott Benny, Bruce Hulse, Bob Lazzaro, Ed Wieloch**



# ANNUAL TURFGRASS CONFERENCE PROCEEDINGS

1973

---

Conference presentations have been approved by the individual speakers.

---

The various topics are presented for your information as follows:

Drainage by David Clement . . . . .	A-1
Fairway Renovation at Baltusrol Golf Club by Joseph R. Flaherty . .	A-4
Converting to Kentucky Bluegrass Fairways by Thomas F. Rewinski . .	A-10
Grooming the Golf Course by Melvin B. Lucas, Jr. . . . .	A-12
Turf Diseases of 1972, Controls and Prevention for 1973 by Stanley J. Zontek . . . . .	A-13
Noncropland Weed Control by John E. Gallagher . . . . .	A-16
Soil Factors Affecting Arsenic Toxicity by Robert N. Carrow . . . .	A-24
The Necessity of Cart Paths and Traffic Regulations by William G. Buchanan . . . . .	A-27
Herbicides for Turfgrass Areas by John A. Jagschitz . . . . .	A-29
Perspectives on Lawn Making and Keeping by Robert Schery . . . . .	A-33
Stadium Turf Maintenance by George P. Toma . . . . .	A-39
Highway Turfgrass by Robert W. Duell . . . . .	A-44
Cemetery Maintenance by Martin Stolpe . . . . .	A-50
Keeping Records by Al Barauskas . . . . .	A-54
Planning Capital Expenditures by Sherwood A. Moore . . . . .	A-59
British Golf Course Architecture -Historical Influences- Current trends by F.W. Hawtree . . . . .	A-64
Golf Course Architecture in North America by Geoffrey S. Cornish . .	A-70

\*\*\*\*\*

## DRAINAGE

David Clement, Superintendent  
Crestview Country Club  
Agawam, MA.

Water management is perhaps the most critical aspect of turf grass maintenance. Every plant function is either directly or indirectly influenced by water. Plants cannot live without water and yet an excess of soil moisture due to poor drainage, can severely weaken turf plants and make them more susceptible to disease. We must try to balance the amount of water in the soil with that which is needed by the turf to maintain consistently the quality of turf desired.

I believe solving a drainage problem can prove to be more of a challenge than solving a problem of "not enough water" for the turf. With the modern irrigation systems we have today water can be added to most any area during a dry spell. However, finding a solution to a wet, soggy depression in a landing area of a fairway or for the tight soil on a green where water will not drain out of a cup for hours after a rain, can pose a real problem.

There are three main types of drainage: surface and run-off; water movement through the soil; and evaporation. I will discuss these briefly. Surface drainage is essential for removal of excess water during heavy storms; positive surface drainage through the use of slope is the key to being able to maintain a uniform stand of turf. However, slope alone is not enough. In addition to good surface drainage, you need good internal soil drainage to move water through the root zone. Infiltration into the soil is dependent on the size of the pores at the surface. Unfortunately, compaction, thatch, dust accumulation, heavy soils, and other factors combine to reduce the effectiveness of surface infiltration. The third is evaporation at the surface, which occurs when neither good surface drainage nor good internal drainage is present. Water standing in a depression on a fairway or green not only weakens the turf but also interferes with the golfer. Therefore, a superintendent should strive to provide good surface and internal drainage.

Most natural soils contain a network of large subterranean pores in the form of cracks, worm holes, root channels, and so forth. The system of channels, when functioning properly, will carry water into the soil and readily exhaust the soil air displaced by the water. However, when the soil is disturbed during construction of a golf course, the large channels are usually sealed over at the surface thus reducing the ability of the soil to absorb water and exhaust air. Traffic over the soil surface by golfers, golf carts, and maintenance equipment tends to pack down and close up the surface pores so that the water cannot enter the soil. It is extremely difficult to maintain a good turf on this hard compact soil.

When a superintendent is faced with a drainage problem, he should first consider surface drainage, where practical. Areas which puddle should be regraded to provide at least 1 foot fall in 100 feet. Adequate surface



drainage is a good insurance policy against standing water when the soil becomes saturated. After surface drainage is considered, corrective internal soil drainage should be investigated. It could be any one of the following factors: compacted surface layer, poor soil structure, restrictive, sub-surface layer, high water table, or thatch accumulation at the surface.

Common methods used to improve soil drainage include aerification, vertical "slit" trenches, subsurface drain lines, and physical modification of the soil to facilitate water movement; and the use of wetting agents which I will not discuss at this time. Let us talk about each of these a little. Mechanical aerification provides a good way of alleviating a surface compact layer to improve infiltration. The large pores or channels open up when soil plugs are removed, permitting water to move through the compact surface zone. In addition, the aerification holes permit better exchange of air at the surface between rains by allowing oxygen to move into the soil to the turf roots and carbon dioxide to escape. Aerification can be viewed as man's attempt to duplicate nature's "channel system" of worm holes, cracks, root channels, structural pores, and so on. Usually the best time of year to aerify cool season grasses is spring or fall, when the grass is growing vigorously. The aerifier holes will function until they fill with water, then surface drainage must be depended upon to remove additional water.

Vertical "slit" trench drains are an excellent means of getting water into the soil rapidly. The idea is to provide a porous pathway through the compacted surface to more permeable layers deeper in the soil. The width, depth, and backfill material can vary considerably, but the principle remains the same: get the water out of the way of the golfer.

Today there is a wide variety of trenching equipment ranging from old chain saws, trap edgers, and slicing machines for use on greens to powered trenching machines which will dig from 2 to 8 inches wide and 1 to 4 feet deep for fairways and rough. Many golf courses have purchased their own trenching machines and as wet spots are observed, they are taken care of. The best width for fairways is 3 to 4 inches, as trenches smaller than 3 inches tend to seal over with fine soil particles and not function for drainage. Trenches wider than 4 inches are slow to grass over and may tend to be droughty. The vertical trenches should be back-filled to the surface with coarse sand, clean fine gravel, crushed stone or pea stone. It is desirable, though not essential, that the vertical trench connect with a drain line, another trench or a dry well. Unless the trench has an outlet, the trench will only function until it fills with water when the soil is saturated.

Now let us talk about drain lines for a while. Perhaps the most misunderstood by people working with turf is drain lines or tile lines. Many feel that the installation of drain pipes in the soil will solve all the drainage problems, only to be disappointed when the water puddles remain on the surface for hours after a heavy rain. Some install drain



pipes shallow in the soil and are discouraged to discover that the outlet is dry after a rain.

The primary function of a drain pipe is to remove excess subsurface water when the soil becomes saturated; water cannot move into a drain pipe until the surrounding soil becomes saturated. Therefore, to provide optimum growing conditions for turf roots in the surface 2 feet of the root zone, the drain pipe should be at least 3 to 4 feet deep. A drain installed less than 2 ft. deep in the soil does little to improve drainage since water will not move into the drain pipe until all soil deeper than the pipe becomes saturated. A shallow drain pipe cannot lower a high soil water table, so install drain lines at least 3 to 4 ft. deep in soil wherever possible.

The presence of a drainage line at 3 ft will not improve surface infiltration if the pores in the soil are compact and will not conduct water to the pipe. Therefore, for quick infiltration and removal of surface water, drain pipes are not the answer unless they are connected to the surface by vertical "slit" trenches filled to the surface with coarse sand, fine gravel, crushed stone or pea stone, or unless the drain has a surface inlet pipe protected by some type of grate.

Flexible plastic drain pipe is available in many sizes today and is replacing most all other type of drainage pipe because it is lightweight, easier to install, with far less connections to be made. In my experience, the best drains you can install are "slit" trenches with a pipe near the bottom. I feel it is essential to have an outlet either into existing streams, ponds, swales, existing drainage or tile lines. We install ours approximately 6 inches in width, 1 to 4 feet in depth, try to keep a slope or pitch to the bottom of the trench, level it out smooth; install 4 inch coiled ADS plastic pipe and fill the trench to the surface with trap rock. This has worked very well on our course. We have installed 2 to 3 miles of them in the past 2 years.

The last big drainage project we did was in October of 1972. We installed 13,250 ft of 4 inch ADS pipe in a two week period. Many people find this hard to believe, so I will run through the procedure and tell you how we were able to do this. First, the drainage project was written up and planned in advance, as to the amount of pipe, traprock, rental of equipment, amount of excavated material and where it would be dumped. This proposal was written and presented to the greens committee in July and was not approved until October.

We hired a Cleveland Pinwheel trencher that could dig 1500 to 2500 ft of trench a day and load the excavated material into a truck. This was the only piece of trenching equipment I could find that could load into a truck, besides a backhoe. He would dig anywhere from 1' to 4' in depth and about 16" in width. He would dig a trench and load the excavated material in a truck where it was used to enlarge a tee in the area; then we would clean the bottom of the ditch; put in 3 to 6" of 3/4" trap rock in the bottom, smoothing and leveling it out with a rake; install 4" ADS



coiled drainage pipe; then fill the trench to the surface with 3/4" trap rock. Most all these trenches were installed in the rough along the edges of the fairways to intercept the surface water that would run onto the fairway after heavy rains or melting snow, as most of our fairways are lower than the surrounding area. These trenches also serve as main line carriers. To drain the fairway of any low depressions or wet area, all we have to do now is dig a short trench 50' or so with a small trencher to these main lines and the wet spot disappears.

We have dug over 3 miles of trench in a two week period, and I feel with the drainage that we have done before this last project that we are well on our way to draining our course.

---

#### FAIRWAY RENOVATION AT BALTUSROL GOLF CLUB

Joseph R. Flaherty, Superintendent  
Baltusrol Golf Club  
Springfield, N.J.

In September 1968 at Baltusrol Golf Club we took the first steps in what later developed into a complete renovation program of thirteen fairways on our upper course, four fairways on our lower course, and a modified program aimed at Poa annua reduction in the balance of our 36 fairways. For any club, this is a major project in size, scope and importance. Several acres of fairways are effectively taken out of play, and so three primary conditions must be satisfied before embarking on a job of this magnitude, these are:

1. Certainty of the existence of a turf problem serious enough to justify the severe disruption of play inherent in a renovation program;
2. Development of the best possible line of communications between the Superintendent, the Greens Chairman and the Board of Directors;
3. Precise planning of the entire procedure and close direction of each step in the operation by the Superintendent.

I think it is appropriate to discuss some of the background situation which led to the decision to renovate so many of our fairways, as well as to mention why many others were dealt with in a different manner.

In the years prior to 1970, the irrigation system at our Club was archaic in principle, outmoded in design, and inefficient in its distribution of water. This situation, coupled with an absolute minimum quantity of irrigation water available to begin with, was undoubtedly the greatest contributor over the years to the problem we were faced with on our fairways in the late 1960's. Prior to the installation of our automatic irrigation system in 1969-1970, we irrigated 36 holes with



twenty-two travelling sprinklers and a total water supply, drawn from four wells, of 500 g.p.m. Three nights were required to cover the entire length of a fairway in many cases, one sprinkler travelling about one third the length of a fairway each night. No method was available to apply additional water in periods of high wind velocity and low humidity, nor to apply lighter, more frequent waterings during times of high temperatures and very high humidity. Also, our soil has a very high clay content and water percolation is very slow. These conditions are ideal for development of a dense thatch layer, and the situation is aggravated when a flexible irrigation system, which can apply varying amounts of water as weather conditions demand, is not available.

During the dry summers of the 1950's and through 1966, the club did not encounter any particularly severe problems with its fairway turf other than the normal browning associated with insufficient water, and the brown areas would green up with rain and cool weather in late summer and early fall. On June 15-18, 1967, Baltusrol hosted the United States Open. On Sunday night after the tournament was over, heavy rains began and set a pattern for the rest of the summer of above normal precipitation, below normal sunshine, and oppressive humidity; ideal conditions for wet wilt which we were powerless to control with an inadequate irrigation system. By the end of the summer all of our fairways had been severely damaged by wilt, and we took the usual approach of overseeding the worst areas while allowing natural recovery on the less severely damaged sections. Whatever recovery occurred in the fall of 1967 was negated by serious dessication damage the following winter, during which we had severe cold, high winds, and no snow cover whatever during February and March. In the summer of 1968 our fairway turf was in as bad if not worse condition than it had been in August 1967. In addition to winter injury to established grasses, we found that germination of the new seed sown the previous fall had been very poor, primarily due to crowding from heavy thatch. It was now obvious that a thorough thatch removal operation would be a pre-requisite to any successful overseeding. In August 1968 we began. Before completing even one fairway, I could see that we had a problem to deal with that was much more serious than I'd anticipated. In many areas of the fairway, thatch accumulation was such that the vertical slicing machine, rather than cutting a slit through the thatch layer and into the soil, would simply tear out large sections of turf, many as large as the hood of an automobile. One fact was immediately apparent, any conventional program of thatch removal and overseeding would be totally impractical under the circumstances we were faced with. The only course offering any hope of long range success was renovation by the scorched earth method; completely remove all plant material down to soil level, overseed and aim towards complete turf renewal on our fairway.

After discussing the situation with Alexander Radko of the USGA Green Section and Dr. Ralph E. Engel of Rutgers University, both of whom agreed that under the circumstances the scorched earth approach offered the best hope of success, we decided to begin immediately. By this time, however, it was the third week in August, too late to do the



job safely so that we could be certain of satisfactory growth prior to winter. Therefore, we decided to work only on an area of limited size so that we could have seeding completed no later than October 1.

Realizing that member reaction would be no small problem, we decided to take our three worst fairways, divide them in half down the center from tee to green and renovate one half, leaving the other side untouched. In this way the golfer could move his ball without penalty to the unrenovated portion, the hole would not be out of play, and the following summer the membership could compare the two portions of the fairway as to appearance, playability, and endurance of the grass under stress conditions.

The first step in the operation was to spray the areas to be renovated with sodium arsenite at 20 lb/acre. Three days later we sprayed again at the same rate. The purpose of splitting the applications was so that the second spraying would kill any bent stolons or Poa annua seedlings which had been sheltered from the first spraying by the top growth.

Once all vegetation was thoroughly burned, we used two vertical slicing machines, crossing the area at right angles to each other, to pulverize the thatch and completely sever its attachment to the soil. By doing this, the thatch was thoroughly loosened and fluffed up, and the clean up phase was begun. For this purpose we employed a York rake, dragging the dead material from the fairway into the edge of the rough; from here it was picked up and hauled to our dumping area. The area to be renovated now presented us with a clean, trash free soil surface.

Soil tests taken the previous fall showed that our fairway pH's were quite acid, falling between readings 4.9 and 5.4. The magnesium and calcium levels were also quite low. Lime had always been applied regularly and in ample amounts, so at first we couldn't understand why our soil reaction was so acid. The answer became immediately apparent when we pulled the dead thatch off the fairways. A readily visible accumulation of lime ran throughout all the removed thatch; it had been trapped there and most of it never got down into the soil where it was needed.

I felt it highly desirable, while we had a bare soil surface to work with, to incorporate the needed lime well into the top two or three inches of topsoil. Yet it seemed best to avoid discing it in, as the disc would invariably turn up many rocks, compounding the time and effort required to complete the job. A solution to the problem of working the lime into the soil with a minimum of disturbance was found in the use of two aerifiers. We went ahead and spread ground dolomitic limestone at the rate of 2 tons/acre and pulled the aerifiers over the area set as deep as possible, so that the machines were actually riding on the spoons, with no weight on the tires. We passed over the fairway in all directions, at least ten times altogether, until no sign of lime remained on the surface. This intensive aeration also did a beautiful job of simply loosening up our tight, heavy clay soil.



Final preparation of the seedbed was accomplished by breaking up the clods left by the aerifiers with two more passes over the area with the vertical slicing machine, again at right angles to each other. This produced a smooth, loose surface without actually pulverizing the topsoil and destroying its structure.

For our seeding, we decided on a mixture containing 60% Astoria colonial bentgrass and 40% Seaside creeping bentgrass. The aggressive Seaside would produce a tight turf with more rapid healing of divot marks and other injury while the more upright growth habit of Astoria would give a bit more cushion for a golf ball's lie and diminish the grainy, swirled appearance we might get from a pure Seaside stand once it matured. We spread the seed, unmixed with any carrier, with a drop-type spreader at a rate of 80 lb/acre. The seeded acreage was then dragged with a section of galvanized steel fence fabric, very lightly weighted at the end with a piece of 3/4" pipe. Finally, the fairway was rolled with a standard hollow roller gang, unweighted from water or any other source. The job was now completed; we watered the seedbed lightly as needed to maintain a surface moisture, usually once daily around 11:30 AM and occasionally, if a particular day called for it, again around 2:30 PM.

The results produced on these three trial fairways were excellent. In the next two years, 1969 and 1970, we completed the three fairways begun in 1968, plus twelve other fairways on our upper course and four on the lower course. We decided not to completely renovate the remaining fairways on the upper course by the scorched earth method because their topography presented too great a hazard of severe erosion in the event of heavy rains prior to maturation of a good grass cover. On the lower course we renovated only Nos. 1, 2, 3 and 18. Complete renovation was not necessary on fairways #5 through #17 as these had been done in the early 1950's using cyanamid as a sterilant. Results were excellent at that time, and the bentgrasses sown some twenty-years ago were still in good condition. There was some thatch accumulation, but it was easily manageable in conjunction with a Poa annua control program using tri-calcium arsenate, the inception of which I can now discuss in the context of our overall program.

In the<sup>late</sup>/fall of 1968, Al Radko of the USGA Green Section visited the club to assess the progress we'd made on our first three trial fairways. He remarked at the high percentage of bentgrasses which had germinated vis-a-vis Poa annua, and suggested that so long as the areas were so nearly clean of Poa that it made good sense to try to keep it out permanently with tri-calcium arsenate. I had heard many rumors to the effect that the chemical had supposedly caused some disastrous results, but after considerable thought over the winter, decided that it was worth a try; if successful, we could try to bring the Poa annua percentage in our fairways to a minimum, whether they were scheduled for total renovation or not.

In April 1969 we applied 6 lb/1000 sq.ft. of actual arsenate from tri-calcium arsenate to the three fairway areas renovated the previous



fall. By late summer the arsenate had taken out most of the Poa annua that had re-appeared with the bentgrass, but caused no apparent injury to the bentgrass itself. At this time we decided not only to treat all areas to be renovated in the future with tri-calcium arsenate, but to use it on those fairways that were either topographically unsuited to scorched earth renovation or had sufficiently high percentage of bentgrass with manageable thatch that complete renovation was not justified. In the spring of 1970, we applied 6 lb of actual arsenate/1000 sq.ft. to fairways #1, 2, 4, 8 and 16 on the upper course, placidly expecting to find, as I'd heard many times, that when the arsenate killed the Poa annua under summer stress, we would be pleasantly surprised to discover how high the bentgrass population really was in our fairways. In our case quite the opposite proved to be true. We soon found out how much turf we'd taken for granted as predominantly bent was mostly Poa annua. These fairways, by August 10, looked as if they'd been sprayed with sodium arsenite except for isolated patches of bent or bluegrass scattered throughout. They proved to be more of a public relations problem than the holes dealt with by the scorched earth method; the isolated green areas gave the impression that the rest of the fairway had died from neglect. In spite of the danger of erosion on hilly areas, we found that on both #2 and #4 fairways on the upper course it would be necessary to remove all of the dead material, just as we'd done on the fairways that were totally renovated. We were fortunate beyond our best expectations in that we had no heavy rains, minimal soil erosion, and a good catch of grass before winter.

In the spring of 1971, we applied another 4 lb of actual arsenate to all upper course fairways and to the four lower course fairways we'd renovated in the fall of 1970. By this time it was obvious that in spite of the arsenate applied in April of 1969 and 1970, Poa annua was staging a fairly strong comeback in large areas on certain fairways. After serious discussion between the manufacturer, Al Radko, and myself, we concluded that the slow build-up to permanent toxicity levels was a result of the high clay content and highly buffered nature of our soil, and that we would simply have to apply more arsenate over a longer period of time to achieve toxicity than would be the case with a lighter less highly buffered soil type.

On lower course fairways #5 through #17, which were not renovated, we faced a slightly different problem. After three years of renovation, member reaction to the annual disturbance in play was becoming a factor of increasing significance. Thus, we hoped, on these fairways to avoid a complete loss of Poa annua in any one season, trying instead to discourage and weaken it so the surrounding bentgrasses could gradually become predominant. On these holes, therefore, we applied only 2 lb of arsenate/1000 sq.ft. in April, and another 2 lb in early August. As things turned out, however, we couldn't really determine whether the separate applications at a lower rate actually gave a more controlled reduction in Poa annua population. In mid and late August we had several very heavy rains with general inundation of large areas of the fairways and considerable loss of both bent and Poa annua. We overseeded



these fairways in September and early October with the same Astoria/Seaside mixture used on the renovated holes.

By late winter of 1972 we did learn one important fact in regard to the performance of tri-calcium arsenate under our particular conditions at Baltusrol. On the fairways where we split our application into 2 lb. in April and 2 lb. in August (cumulative total 4 lb. actual arsenate), there was a great deal less Poa annua present than on those where we'd made a single April application of 6 or 4 lb. in 1969, 1970 and 1971 (cumulative total 10 or 12 lb. actual arsenate). I have no precise explanation for this result. Perhaps the time lag from application in April to Poa annua's principal germination period in late August allowed the arsenate to become chemically bound in our heavy clay soils and thus unavailable to kill the germinating Poa annua. Whatever the reason, the effect was so obvious that in 1972 we used the split April-August application (2 lb. actual arsenate each time) on the entire course, and anticipate continuing this timing in the immediate future.

The ultimate question that comes to mind is: "How long will we have to keep applying tri-calcium arsenate, and at what rates, and to what total accumulation, before adequate control of Poa annua is established?" I don't know the answer to that question, and I don't believe any answer exists that can be conscientiously applied to a generalized situation. Probably the greatest variables involved are the structure, phosphorus content, and buffering capacity of the soil on a particular golf course, and for that matter in different areas of the same course. It must be constantly kept in mind that the objective of the program is to control Poa annua, not to eradicate it. Where gradual reduction of the percentage of Poa annua in established turf is planned, with no intention of complete renovation, it is imperative to proceed cautiously and at low application rates until the effects of each application can be seen not only on Poa annua but on adjacent desirable grasses. At Baltusrol, I plan to apply 4 lb. actual arsenate again this year, 2 lb. in April and 2 in August. If by the year's end the Poa annua is a small minority in our grass population, perhaps in 1974 we will reduce the total to 2 lb., applied in early August. From there on, I believe, careful observance of both the remaining Poa annua and the bent-grasses with special effort put into watching for any evidence of root inhibition on the bent, will serve as a yearly guide in what must be an annual decision as to whether or not to apply more tri-calcium arsenate in any given year.

To date, tri-calcium arsenate has worked well in reducing the percentage of Poa annua in the fairways at Baltusrol. Anyone embarking on the program, however, must remember that he is going to encounter some very difficult periods both with his turf and the feelings of the membership. At best, the chemical must be used very cautiously, preferably on an experimental area at first, and as repeated applications are added careful monitoring of effects on all grasses is imperative. Yet, in our



area, general loss of Poa annua is a real possibility in a difficult summer with or without an arsenate program being a contributing factor. If, as seems to be the case, tri-calcium arsenate offers the possibility of lessening our dependence on this weak and unpredictable grass in our turf areas, I feel that the benefits that will accrue to a club over the long run are well worth the risk and trouble involved. As I said above, Poa annua may well let us down anyway. If we can reduce its percentage, and thus our reliance on it as a significant proportion of fairway turf, both the club and the superintendent will benefit from its loss.

-----

### CONVERTING TO KENTUCKY BLUEGRASS FAIRWAYS

Thomas F. Rewinski, Superintendent  
National Golf Links of America  
Southampton, N.Y.

This is a report on the fairways management program at the National's Golf Links of America from 1958 until the present. The National is a hilly, rolling course on basically sandy and sandy loam on Long Island's east end. In early 1968 a Toro automatic multiple row irrigation system was installed to service the 50 acres of fairway.

Upgraded fairway management was begun at the National in 1958. In the fall of that year, all fairways were thatched with the Smith Aero-thatch machine and seeded with Common Kentucky bluegrass and Penn-lawn Fescue at the rates of 75 lb/A and 50 lb/A respectively. Limestone was added at 1 T/A and fertilizer (8-6-4 50% slow release) at 600 lb/A. After this first year, a standard program was instituted through 1969. Each fall all fairways are thatched. To facilitate this operation, half were done with an Aero Blade and half with the West Point Aerifier (Coring Type). The Aero Blade produced the better results, though it was a slower process. Fairways were then seeded 30 lbs. Penn-lawn fescue and 25 lbs Common Kentucky bluegrass/acre. A wheelbarrow seeder was used. The fertilizer schedule each year was: 600 lbs 8-6-4 (50% slow release) in late April, 500 lbs organic in late June, and 500 lbs 8-6-4 (50% slow release) in mid September. Limestone was added each fall at the rate of 1/2 T/A. There was no fungicide program during this period. Fairways were cut twice each week at 1 1/4" during the good growing months but only spot cut during the dry months of July and August. The fairways were considered to be in good condition with 70% annual bluegrass. However, in order to promote a more even growing season and eliminate the poor cover during the dry months, the Toro multiple row watering system was installed by early summer 1969. The advent of irrigation provided the opportunity to change the composition of the fairway grasses.



A tri-calcium arsenate program was begun on 17 March 1969 with an initial application of 6 lbs 48%/1000 sq.ft. as measured from the container and increased to 8 lbs/1000 sq.ft. in 1970, 1971 and 1972. In 1973, in order to maintain the calcium arsenate level, only 2 lbs calcium arsenate will be applied. Starting 15 August 1969, all fairways were thatched with the Rogers Aero Thatch, Model 548 and seeded with Fylking Blue at 30 lbs per acre. This 7 week operation was repeated in 1970. There were neither thatching nor seeding operations in effect for 1971, but were re-introduced in 1972 with the Rogers machine and an equal seed mix of Fylking and Baron at 10 lbs/Acre. This schedule will continue in the future with the possible addition of newer seed varieties at the same rate as not to be totally dependent on one strain of bluegrass.

The fertilizer schedule for 1970-71 and 1972 was: 800 lb/A Milorganite in June and 400 lb/A 20-0-10 (50% slow release) in October. One possible improvement in the fertilizer program would be to apply between 1/4 and 1/2 lb N/1000 sq.ft. in several applications through the growing season. This would allow for a more consistent color and growth. A fairway fungicide program was instituted consisting of a monthly application of Acti-dione Ferrated with a double application for June. These 8 applications proved most effective.

During the 1970 season, 12.5 million gallons of water were used for irrigation, including greens and tees. During 1971, an extremely dry year, 15 million gallons of water were pumped out over the course. In 1972 only 10 million gallons of water were used due to an unusually rainy spring. The fairway mowing schedule was increased to 4 cuts/week at the closer cut of 3/4". For the past three years, the National fairways have been in excellent condition. The Kentucky bluegrasses are thriving and the annual bluegrass is down to 10-15%. It was found that water should be used sparingly for best fairway maintenance, even allowing some off-color before irrigation.

It was found at the National Golf Links that bluegrass holds up better with less care than bentgrass or annual bluegrass. It is a heartier grass and can maintain its healthy appearance under more adverse conditions than our other grasses. Kentucky bluegrass required less water, less often. And though it means more cutting, it also means a more consistent height for grass which the golfers like for lies. A minimum of water together with our disease control program has produced even, healthy fairways for us which looked good and play well throughout the season.

## GROOMING THE GOLF COURSE

Melvin B. Lucas, Jr., Superintendent  
The Garden City Golf Club  
Garden City, N.Y.

This talk on grooming a golf course is one that could cover so many types. We have been so accustomed to seeing on television some of the most breathtaking types, the so-called monsters, other than the few occasions when we see the courses of the British Isles. I, therefore, will concentrate on courses such as these and will pick out many minor areas that some of us do neglect in the total management scheme.

Many clubs still try and hold on to some of the true values of a golfing society of years past. In many respects it is looked upon as a grotesque beauty and this is only the true reflection of nature's way.

On many courses when playing a round of golf you are constantly confronted with wide open space where no matter how bad your shot is, it is always playable. At this point the challenge has left the game and then we will see the Golf Architect come in and lengthen the course. When doing this it only hurts the average or sub-type golfer who physically cannot encounter that hole in par or most cases bogey.

Some of the toughest and most challenging courses are those of lesser yardage but containing the most strategic areas to place a shot for any type golfer. They enable certain rewards for any shot if positioned well.

The full part of grooming a golf course is laid to rest on the members' desire, money and your knowledge of other clubs that are well groomed so that you can inform your members before they tell you about such and such a course.



## TURF DISEASE OF 1972, CONTROLS AND PREVENTION FOR 1973

Stanley J. Zontek, Eastern Agronomist  
USGA Green Section  
Highland Park, N.J.

"Turf Diseases for 1972, Controls and Prevention for 1973." With a topic like this often times the most logical way to attack it is by going in chronological order. That is, start with the beginning of the calendar year and end 12 months later. In between, you can tell your story in the order it came about. With this in mind, let us start with the winter of 1971-72.

When we speak of winter and winter turf diseases several things should come to mind -- snow and snow mold. In the winter of 1972 there was relatively little of each. Except for some northern tier areas the winter of 1972 was one of the most snow-free on record. Snow mold also seemed to follow this same pattern. There simply was not much around. Perhaps this was due to good chemical snow mold preventative sprays, or it was due to the weather. We tend to feel that it was a little of both.

With so little snow mold (and winter-kill) present in the spring, most golf courses got off to a good start. The weather in the spring, however, did not lend itself to optimum grass growth as it usually does. The extended periods of cool, wet and cloudy weather only stimulated the development of a severe attack of Helminthosporium leaf spot, especially in the more southern areas of the northern region. The reason was simple. The cool, damp weather was optimum for the growth of this disease. Large areas of Kentucky bluegrass were affected. Roughs where common types are grown were especially hard hit.

Fusarium blight also showed its face on northern courses infesting Kentucky bluegrass fairways. This disease is one of our most difficult to control. Recent research has apparently established a link between the Fusarium fungi and nematodes. With both of these agents present and active, Fusarium blight can be a serious and expensive problem on Kentucky bluegrass areas.

Then the rains came. Throughout much of New England and the East far above average rainfalls were recorded. Reportedly, Boston received 73 inches of rain for the year. The New York area received 71 inches. Much of this rainfall came at a time when it was not needed, in the early summer. The rainfall itself caused severe turf problems, especially where drainage was not present, or inadequate. Traditionally, heavy rains bring on turf diseases, especially dollar spot and to some degree melting out. In more southern areas Pythium becomes a problem. This year was no exception; however, the disease problems were not as severe as the heavy rainfall. We believe this is a reflection of better fungicides and better fungicide application programs.



The year ended on the generally cool, damp side. As of yet, the heavy snows have not come and with abundant moisture desiccation, so far, has not been threatening. Perhaps this too will be a good winter when most golf courses escape the blemishes of winter injury.

What does 1973 hold in store for us and what are the best ways to control the major turf diseases if they arise? The following are some diseases that could very well affect turf in 1973, and some of their controls.

In reality, the first major turf disease of each year is the pink or Fusarium type of snow mold. Actually this disease does not require a snow cover to be active, only cold, moist conditions. In the early spring, if this disease is working, it can be controlled by an application of a systemic fungicide or some of the contact materials like Daconil, Dyrene, Cadmium and Thiram (or a Thiram-Cadmium mixture). Also working at this time is the beginning of the Helminthosporium spp. leaf spot disease. A general rule of thumb for this disease is, spray as soon as possible in the spring with a good leaf spot material. The earlier the better, even before the first cutting. Research and experience has shown that if the leaf spot organism is held in check in the early spring, it will cause fewer problems later on. If done when damage is noticed, the bluegrass could be in a weakened condition through one of its peak growing seasons and this could result in a thinner, weaker stand in the summer.

Another disease that can injure your bluegrasses at this time is Fusarium blight or Fusarium roseum. Once established, it is one of our most difficult and expensive to control diseases. As mentioned earlier, this Fusarium disease could also be linked to nematode activity. At present, heavy rates (6 to 8 ounces per 1,000 sq.ft.) of systemic fungicides, drenched into the soil, offer one avenue of control. It is interesting to note that heavy rates of the systemic fungicide appear to have some mild nematicide properties in addition to their fungicidal properties. The link between the Fusarium fungi and the nematodes requires investigation and soil testing before any regular nematicide treatments should be made. Also, further university level study of this controversial disease is in order. Proper management practices are also most helpful in lessening the effects of the disease and, in fact, in slowing the initial development of this disease. It has been shown that Fusarium roseum is associated with turf weakened by high temperatures, excessive nitrogen, thatch accumulation, close mowing and either improper watering, or a prolonged drought. If the management practices on the golf course avoid these situations as much as possible, then perhaps this troublesome disease can be avoided or minimized, and the resulting controls would not be necessary.

Sclerotinia spp. dollar spot, the traditional summer turf disease could again be a factor in 1973. However, the newer systemic fungicides have given and should continue to give exceptional long-lasting dollar spot control. Our experience has shown that under most conditions during the summer that one ounce per 1,000 square feet of these systemics (Tersan 1991, Cleary's 3336, Fungo, Spot Klean, Topsin-M, TD-1771, Mertect 140 and 746 Turf Fungicide) should give about four weeks dollar spot control.



If on a shorter spraying schedule, this one ounce per 1,000 square feet could be correspondingly reduced.

The systemics, though longer lasting in dollar spot control, do not give the broad spectrum of control that the "old standby" contact fungicides do. These contacts would include products like Acti-dione, Daconil, Dyrene, PCNB, the Manebs, Thiram and Zinebs, plus the cadmium compounds. Perhaps an integrated spray program could be set up using the strong points of each type of fungicide, i.e., the long-lasting dollar spot control of the systemics and the broad spectrum control of the contacts. Either mix them in the spray tank as they are apparently compatible, or alternate their usage. By doing this, you could use the best points of each type of material to give your members a disease-free turf throughout the prime golfing season.

Another point should be made. Recently, in some widely scattered areas of the country, instances of systemic resistant dollar spot have been reported. This condition is similar to the outbreaks of cadmium and mercury resistant strains that developed some years ago. The solution to controlling this resistant type of disease is the same as before. That is, change the general class of fungicides used. If the disease is resistant to contact materials, then use a systemic product. If the disease is resistant to systemics, use a contact. Perhaps this situation is making a mountain out of a mole hill, but we feel that you should be made aware of the problem. If ever you are confronted by a resistant strain, you could apply the before mentioned general rule. It should do the job.

This summer, if conditions are right, brown patch could be a problem that could thin some turf if not closely watched. Generally, there are good controls for this disease. The contact fungicides, along with the higher rates of the systemic products should do a fine job of controlling this disease for you.

Pythium could also show itself this year in some southern regions of New England if the proper conditions develop as they did last year. As in the case of brown patch, there are several good controls available when the disease is seen. The contact products Koban and Dexon and the systemic Tersan SP (Demosan) are the primary materials for Pythium control. Preventative control is not usually feasible so only curative applications are warranted if the disease is active on your course.

When the summer passes and the cooler fall season rolls around, Helminthosporium leaf spot should begin to become active on susceptible Kentucky bluegrass. If the disease is severe enough, spraying with a contact fungicide labeled for leaf spot should keep the bluegrass growing well and make it strong for the winter months ahead.

Of growing concern is what to use for snow mold next year with the restriction of the mercuries in New York, and now in Connecticut. There are several approaches. One would be to use the systemics Tersan SP (effective on gray snow mold) and Tersan 1991 (effective on the pink varieties). Contact materials should also work well. Mixtures of Cadmium and Thiram (4 and 8 ounces per 1,000 square feet respectively) have



performed well in the past. There are other products labeled for snow mold that could also do the job. With all of them it is important to read the label and time the applications well. It may prove beneficial to spray on light application of the snow mold fungicide when the leaves drop in the fall (mid- to late October or early November). Spraying at this time when the snow mold organism is "fruiting" can cut down on disease inoculum (spores) going into the winter. With less inoculum in the soil there should hopefully be less disease present in the spring. Another application at the full rate can then be made, as usually done just before the snow flies later in the fall. There are alternatives to the use of the restricted mercury compounds. For snow mold control, unfortunately, they could be more expensive.

In conclusion, no one knows what the season of 1973 holds in store for us. But, when the superintendent is aware of the possible problems and has a good curative or preventative fungicide program planned, major turf disease injury, hopefully, should not arise.

---

#### NONCROPLAND WEED CONTROL

John E. Gallagher  
Research and Development  
Agricultural Chemicals Div.  
AMCHEM Products, Inc.  
Ambler, Penna.

#### What Is Noncropland Weed Control?

Noncropland weed control involves the use of herbicides (weed killing chemicals) in storage areas, lumberyards, and parking lots; on tennis courts and racetracks; under pipelines and transformer cages; under guardrails and surrounding signposts on highways and lights on runways; near fire hydrants, trestles and bridges; on public utility rights-of-way; on gravel blanket areas; around buildings, grain elevators, utility poles, and tank farms; along fence rows and ditch banks; for firebreaks; and in similar areas where any plant growth is undesirable. The above list of potential areas for noncropland weed control is impressive. The troublesome pests may be broadleaf weeds, grassy weeds and woody plants.

#### Why Control Noncropland Weeds?

Weeds are undesirable, unnecessary, and unsightly. They mar the aesthetic beauty of business and industrial property. They impair operating efficiency. They are also a hazard.

Weeds block visibility for public and operating traffic, plant protection men, and other employees. They conceal signs, markers, and switches and also hide rubbish. They impair inspection and maintenance of railroad facilities, pipeline installations, security fences, electric substations, pumping stations, etc.

Woody plants cause interruptions to telephone and electrical service. Falling trees or limbs pull down conductors. Tall growing bushes cause short circuits by coming in contact with conductors.

Weeds create fire hazards. Dead and dried weed growth can be easily ignited by a spark or discarded cigarette.

Weeds tend to hold moisture especially following a rain or heavy dew. The resulting dampness encourages rusting of metal fences, rails, and buildings. Decay of wooden structures is also favored.

Weeds obstruct water flow in drainage ditches and culverts increasing the possibility of water damage to materials, buildings, and property.

Weeds create health hazards to employees and the public. Some are poisonous - poison ivy. Others have offensive odors or produce pollen that causes hay fever. Weeds provide cover and breeding places for insects and rodents.

### General Considerations for Herbicide Use

#### Choice of Herbicides and Rates

In choosing an herbicide or a mixture of herbicides and the rate of application for weed control in a noncrop area, the user should consider several environmental and site characteristics. They include (1) the dominant kind of vegetation present -annuals, deep-rooted herbaceous perennials, grasses, broadleaf weeds, mixed vegetation, or woody plants; (2) the objective - total vegetation control (soil sterilization -bare soil), selective control of broadleaf weeds and tall coarse grasses from short competitive and soil-binding grasses, or control of tall woody plants; (3) the type of soil - light sandy loam, clay with high or low organic matter content; and (4) the amount and distribution of rainfall.

#### Classification of Herbicides

Herbicides for noncropland weed control may be grouped on basis of mode of action into contact, translocated, and sterilant chemicals. A contact herbicide kills primarily by contact with plant tissue. These chemicals are effective against annual weeds but only "burn off" the tops of perennial weeds.

Translocated herbicides are also called growth regulators and systemic herbicides. Translocated chemicals may be absorbed by the leaves and stems or by the roots. When absorbed by the leaves and stems,



the chemical commonly moves with the food materials manufactured there. An overdose on the leaves may kill the immediate cells quickly and thus prevent effective translocation. When absorbed by the roots, the translocated chemical moves in the water conducting (xylem) tissue of the plant.

A soil sterilant prevents the growth of plants when present in the soil. It does not necessarily kill all life in the soil, such as fungi, bacteria, and other microorganisms. The toxic effects may remain for only a short time or for years.

Some of the materials used in noncropland weed control are:

#### Classification of Herbicides for Noncropland Weed Control

<u>Type</u>	<u>Herbicide</u>
Contact	Ammate X DSMA MSMA Cacodylic acid Paraquat
Translocated	2,4-D 2,4,5-T Silvex Dowpon
Soil Sterilant	Pramitol 25E, Pramitol 5P Hyvar X-WS Chlorate - Borate mixtures

Many herbicides that are effective on broadleaf weeds are not as effective on weedy grasses and vice versa, but some herbicides are effective on both types. For example, 2,4-D and silvex are primarily broadleaf weed killers while Dowpon is more effective on grasses. Usually the herbicides that are most soluble in water or oil and are applied in sprays give the most rapid kill of top growth. Herbicides that are less soluble in water usually remain in the soil longer and provide weed control during a longer time. The minimum amount of precipitation required to leach soil-applied chemicals into the soil around weed roots to make the herbicide effective ranges from 2 to 5 inches.

To do a desired job, different types of chemicals may be required. In the case of actively growing dense vegetation, it may be desirable to combine a contact type material with a soil sterilant. The contact would give a "burn off" effect on the existing vegetation, while the soil sterilant would control any regrowth and emergence of new vegetation.

#### Effects of Herbicide Persistence in the Soil on Herbicide Rates

Persistence of a herbicide in soil tends to be longer under conditions of low precipitation, fine or light texture of soil, low organic content,

non-submergence by water and low microorganism content of the soil. Higher rates of application are usually required on heavier soils and soils high in organic matter and in regions of greater precipitation. More frequent applications of herbicides may be required to maintain weed control on lighter soils and in areas of greater precipitation. Generally, repeated annual applications of soil sterilant herbicides at relatively light rates are more effective and economical than less frequent applications at heavier rates, especially for control of annual and shallow-rooted perennial weeds and seedling of deep-rooted perennial weeds.

### Soil Sterilization

Soil sterilization is expensive and is practical only where complete vegetation control is desirable and soil erosion is not an important factor. Such areas are around signposts, bridge abutments, trestles along highways and railroads, utility poles, and buildings, under guard-rails and transformer cages, along pipelines, on tank farms near structures, above concrete linings along canals, and in parking lots and other non-cultivated land where accessibility visibility, fire prevention, and other considerations justify the expense.

### Programs for Noncropland Weed Control

Listed below are some approaches to controlling broadleaf weeds, grassy weeds, and woody plants in different noncropland situations. Do not use any of the treatments where adjacent trees, ornamentals or crops might be affected.

#### 1. Soil sterilization (bare soil).

For nonselective control of annual and perennial broadleaf weeds, grasses, most woody plants, and some vines, use one of the following:

- a. Pramitol 25E, a emulsifiable concentrate, at 20-30 gal per acre in 50-100 gal of water. (4-5 1/2 pts. in 2 gal water per 1000 sq.ft.) For faster knockdown of established weeds and grasses apply in 100-200 gal oil. For maintenance application in following seasons, reduce rate in half.
- b. Pramitol 5P; pellets containing 5% prometone, 40% sodium chlorate, and 50% sodium metaborate; at 2 lb per 100 sq.ft. For maintenance use 1 lb per 100 sq.ft.
- c. Hyvar X-WS, a water soluble powder, at 44 lb per acre during growing season and at 48 lb per acre during the dormant season. For applications during the growing season, add 2 quarts of a non-ionic surfactant to each 100 gal. spray solution. Apply in 220 to 440 gal. water per acre. For retreatments in the following season use 22 lb. Hyvar X-WS per acre.
- d. Sodium chlorate - sodium metaborate mixtures at 1 to 2 lb. per 100 sq.ft.



## 2. Broadleaf weeds

- a. To control annuals, shallow-rooted perennials, and seedling perennials, use 2,4-D amine, 1-2 lbs. active per acre, in 50 gal. of water or more.
- b. To control deep-rooted and other hard-to-kill perennials, use 2,4-D amine, 2-4 lbs. active per acre, in 50 gal. of water or more.

Apply above treatments during early growth or rapid vegetative growth to early bloom. Repeat treatment as necessary to reduce or eliminate weed stand. For weeds difficult to control with 2,4-D use 2,4,5-T. Do not use near hormone sensitive crops, trees, or ornamentals.

## 3. Broadleaf weeds and weedy grasses where soil sterilization is not desired.

### a. Annuals and certain perennials

Apply 3 lb. Karmex plus 1 qt. Paraquat plus 2 qt. surfactant in 100 gal. water per acre.

### b. Annuals, certain perennials, johnsongrass and bermudagrass

Apply 3 lb. Karmex plus 30 lb. Dowpon C plus 2,4-D amine plus 2 qts. surfactant in 100 gal. water per acre.

### c. Annuals and certain perennials where desired to maintain fescue or bermudagrass

Apply MSMA at 1 gal. (5 to 7 lb.) plus 3 lb. Karmex plus 2 qt. 2,4-D amine plus 2 qt. surfactant to 100 gal. water per acre.

Do not use b or c above near crops, trees, or ornamentals sensitive to 2,4-D. Retreatments may be necessary to obtain the desired degree of control. Usually two or three applications will be required.

## 4. Woody vines and briars

- a. 2,4-D plus 2,4,5-T at 1 to 2 gals. per acre.
- b. 2,4,5-T at 1 to 2 qt. per acre is specific for briars.
- c. Trysben 200, at 5 to 10 gals, is a specific control for couritch (trumpet) vine, Virginia creeper, and pepper vine.

Apply any of the above treatments in 100-200 gal. water plus 1 qt. surfactant per 100 gal. of spray mixture to wet foliage thoroughly.

5. Kudzu

- a. 2,4,5-T 4 to 6 lb. per 100 gal. water. Ester form is more effective. Use ester only if no susceptible crops are nearby. Retreatment at 6 week intervals will be necessary.
- b. Trysben 200, 10 gal. per acre initially with thorough coverage of infested area. A follow-up spot treatment of areas where the growers show regrowth should be made early the following season. The areas of regrowth should be thoroughly wet to insure root uptake. The initial application can be made early in the spring first prior to breaking of dormancy (new growth).
- c. Pramitol 25E

6. Chemical trimming

To control weeds in areas where it is desirable to eliminate hand trimming and where it is undesirable to use soil sterilization (bare soil) treatments, apply a spray of Ammate X at the rate of 1 lb. per gallon of water plus 0.6 oz. Surfactant WK (or 100 lb. Ammate X per 100 gal. water plus 1 qt. Surfactant WK). Apply as a mist spray to thoroughly wet the leaves and stems of plants being controlled. For best results, make applications on a warm, sunny day; do not spray during rain or when threat of rain exists. Usually two or three applications per season are necessary.

To control annual broadleaf weeds and grasses and top kill and suppression of perennial weeds use 1 to 2 qts. of Paraquat per acre. Apply for full coverage and thorough weed contact using 50 to 100 gal. of water. Best results are obtained when applications are made to young, succulent weeds and grasses. Mature woody weeds are less susceptible. Repeat as needed. Add non-ionic surfactant at 8 oz. per 100 gal. Paraquat is compatible with many residual herbicides. Avoid spray contact with foliage or fruit of food crops and ornamentals.

7. Woody Plants

The control of undesirable woody plants with herbicides along ditchbanks, roadsides, and utility lines or on flood plains and other noncrop areas differs from that on pastures and rangelands in the following respects: 1) The noncrop areas of woody plants frequently are in narrow strips so that aerial spraying often is not possible or feasible. 2) These areas usually are adjacent to or near crops or ornamentals that are sensitive to phenoxytype herbicides. 3) Much greater care must be used in spraying woody plants. Dormant basal spray, frill, or stump treatments frequently must be substituted for foliage sprays along irrigation canals, reservoirs, lakes, and ponds to avoid contamination of



of water with herbicides not registered for use in water.

4) Noncrop areas generally are closer to adequate supplies of water so that use of high-volume drenching sprays is more economically feasible than it is in rangeland. Consequently higher rates of herbicides and more expensive application methods, such as drenching foliage sprays, aerial spraying with a helicopter, basal sprays, and cut-surfact treatments, are commonly used on noncrop areas.

Chemical Control of Woody Plants (Note: Rates in this section are based on pounds active ingredient)

- a. Foliage treatment: 2,4,5-T amine, 6 lb/100 gal. water.

Controls most woody species; ash, red maple and persimmon generally resistant; rhododendron resistant. Use amine formulations to reduce vapor drift hazard. Use low spraying pressure to prevent spray drift. Wet foliage and stems thoroughly. Most effective results obtained by spraying within 6 weeks after plants have reached full leaf stage. This treatment used primarily on trees or brush less than 6 feet tall. A few species more susceptible to 2,4-D.

or Ammate X, 57 lb/100 gal. water

Controls most woody species. This treatment used primarily in areas near crop or plants very susceptible to 2,4,5-T. Thoroughly wet foliage and stems anytime during growing season. Add 2 oz. spreader-sticker per 50 gal. spray mixture. Wash out sprayer thoroughly after use.

- b. Dormant stem treatment: 2,4,5-T low volatile ester, 8 to 12 lb/100 gal. diesel fuel or oil

Controls most woody species; black locust resistant. One of most effective treatments for control of woody plants. Spray entire plant to good runoff. This treatment used primarily on woody plants less than 10 feet tall. Root suckering species which produce shoots at some distance from the main stem may be resistant.

- c. Basal stem treatment: 2,4,5-T low volatile ester, 8 to 12 lb/100 gal. diesel fuel or oil

Controls most woody species; black locust resistant. One of most effective treatments for control of woody plants. Spray lower 12 inches of stem or trunk and let some solution run into ground. May be used any time of year but much more effective during dormant season. One growing season required before plants die completely. This treatment used primarily on plants less than 6 inches in diameter. Root suckering species may be resistant. Both dormant stem and basal treatments useful to farmers and landowners because during winter there is less hazard to crops and more labor probably available.

- d. Frill treatment: 2,4,5-T low volatile ester, 12 lb/100 gal diesel fuel or oil; or Ammate X, 200 lb/100 gal. water

Controls most woody species. Used primarily on trees greater than 6 inches in diameter. Make one deep gash with an axe for each 3 inches of circumference near ground. Put 1 1/2 teaspoons of AMS per inch of trunk diameter in these gashes. Or make a continuous frill (series of gashes) around the tree trunk. Apply wetting spray of AMS or 2,4,5-T in frill. Crystals of AMS may also be put in gashes.

- e. Stump treatment: 2,4,5-T low volatile ester, 12 lb/100 gal. diesel fuel or oil; or Ammate X, 1.5 teaspoons/in. diameter.

Controls most woody species. Soak freshly-cut stumps with spray solution to prevent sprouting. Or use AMS crystals on stump. Hasten decay of stump by covering with layers of soil and a nitrogen fertilizer. Keep moist.

- f. Tree injection: 2,4,5-T low volatile ester, 1 1/2 lb/4 1/2 gal. diesel fuel or kerosene.

Controls most woody species. Requires use of commercial tree injection tool. Make injections at the ground line. Leave no more than 2 in. between the edges of injection gashes for trees up to 8 in. in diameter and no more than 1 in. between gashes for trees greater than 8 in. in diameter.

- g. Soil treatments: Karmex, 32 lb/acre + 20 lb/yr., or Simazine, 32 to 40 lb/acre

Controls most woody species. Apply around base of trees and brush. Use broadcast or spot treatment. Will practically sterilize soil. Trumpet creeper and blackberry may be resistant. Repeat as necessary.

or Dybar, 12-18 lb/acre

Controls most woody species. Use 1 to 2 tablespoons of pellets on ground at base of brush clumps and 2 to 4 tablespoons spread around drip line. For black locust, sassafras, sumac, and other species with wide-spreading root systems, spread chemical over 2 to 4 sq.ft. at base. Very effective on red maple and turkey oak. Works best on light sandy soils.



### Special Precautions in Use of Herbicides in Noncropland

Despite the absence of food or feed crops and usually of desirable ornamental plants in noncrop areas, all general precautions for safe use of herbicides should be followed. Do not allow livestock to graze ditchbanks, rights-of-way, or similar noncrop areas sprayed with herbicides not registered for use on pastures and do not feed hay harvested from such areas.

Avoid contamination of water to be used for irrigation in canals, ponds, or reservoirs by herbicides not registered for use in aquatic areas or on irrigated crops. Apply such herbicides on banks of irrigation and drainage canals, ponds, and reservoirs only when there is no water in the canal.

Use only amine or low-volatile esters of 2,4-D silvex, or 2,4,5-T for spray applications in noncrop areas that are near sensitive crops or other desirable plants and prevent spray drift onto the desirable plants. Use of low spraying pressure and proper nozzles reduces the danger of spray drift. Additional protection against spray drift onto desirable plants is provided by using invert emulsions of ester formulations and thickening agents with water-soluble herbicides.

---

Trade and brand names are used only for the purpose of information and the North Carolina Extension Service does not guarantee nor warrant the standard of the product, nor does it imply approval of the product to the exclusion of others which may also be suitable.

Prepared by: W. M. Lewis, Extension Agronomy Specialist (Weed Control),  
North Carolina State University, Raleigh, North Carolina,  
January, 1969.

-----

### SOIL FACTORS AFFECTING ARSENIC TOXICITY

Professor Robert N. Carrow  
Department of Plant and Soil Sciences  
University of Massachusetts/Amherst

Poa annua (annual bluegrass) is found on most golf courses in the Northeast. Many superintendents strive to maintain annual bluegrass as an important component of the turf on their courses. Under irrigated, close cut, high maintenance conditions Poa annua can form a very acceptable turf. However, on other courses the inherent lack of stress tolerance has caused it to be considered a major weed.

Once a turf manager has decided to control Poa annua several approaches are possible: (a) mechanical removal with a cup cutter or similar device can be used but it is only feasible for small areas of infestation; (b) biological control with the Hyperodes weevil is possible in a few areas of



the Northeast but again is often not feasible; (c) maintaining the turf so that the more desirable grasses have a competitive advantage is another approach. However, errors in cultural practices, problems with pests and environmental stresses can result in failure; (d) chemical control is the last alternative.

Of the various herbicides used on Poa annua, the arsenicals, especially calcium arsenate and lead arsenate, have been most often employed. The success of these materials has been variable. Of the many factors which can influence an arsenical program, the soil factors are of primary importance. The soil factors reported to affect the activity of arsenic will be discussed below.

Phosphorus - Arsenic and phosphorus are chemically similar and in many cases tend to react similarly. Within the annual bluegrass plant these elements compete in the respiration process. If sufficient arsenic is present respiration is hindered and the plant may eventually weaken and die.

Investigations over a wide range of phosphorus and arsenic levels in soils have shown that high phosphorus levels can reduce arsenic toxicity. However, the magnitude of this response was not great. This points out that a wide difference in the arsenic and phosphorus levels in the soil must be present before any affect on the arsenic-phosphorus balance occurs in the plant. Foliar applications of phosphorus would be expected to influence this balance much quicker.

In the same investigations it was observed that arsenic toxicity on annual bluegrass was less affected by increasing phosphorus levels than was Penncross creeping bentgrass, Cohansay bentgrass and Merion Kentucky bluegrass. Another factor to consider is that during over-seeding small additions of phosphorus may increase seedling survival.

Soil reaction - Arsenic activity in soils can be markedly affected by soil reaction. Under acidic conditions iron and aluminum are present and these may combine with free arsenic to form relatively insoluble compounds. However, if the arsenic is present as calcium arsenate, the acidic conditions may increase their solubility, thereby, increasing free arsenic levels in the soil.

At a soil reaction of 7.0 or above, free calcium carbonate may be present which can precipitate arsenic into insoluble forms. Also, calcium arsenate compounds may form which range from intermediate solubilities to insoluble.

In recent studies it was demonstrated that as acidity increased from pH 7.8 to 4.5, arsenic toxicity increased markedly when using tricalcium arsenate. Increased toxicity was especially apparent at pH levels of 6.0 or below. The pH effect was much greater than was observed for any phosphorus response.



Soil texture - The texture of the soil has been used as a guideline for how much arsenic should be applied to achieve Poa annua control. Soils which contain higher quantities of clay generally inactivate more arsenic than lighter textured soils. The finer textured soils tend to have more iron and aluminum oxides associated with them but even light soils may fix large quantities of arsenic if the iron and aluminum oxides are present. Thus soil texture is only a rough measure of a soil's ability to fix arsenic. More important is the associated iron and aluminum contents and not the percent of clay.

Organic matter - Soils high in organic matter have been reported to require higher rates of arsenic to achieve a given level of control compared to soils with little organic matter. However, several studies have demonstrated that organic matter does not appreciably affect arsenic activity. This is especially true for acid peats. However, alkaline peats can contain free  $\text{CaCO}_3$  which could fix large quantities of As.

Moisture - There are several possible ways by which moisture could influence As activity. First, under waterlogged conditions arsenate may be biologically converted to arsenite, a much more toxic form of arsenic. Second, arsenic may wash down into low wet areas and thereby increase the chances of excessive As toxicity. Third, recent research has indicated that soils maintained below field capacity have lower levels of As activity than soils maintained near field capacity. Finally, the moisture level in the soil influences the physiological health of the turf and therefore may affect its susceptibility to arsenic.

Soil arsenic level - Much of the arsenic applied to the soil will not be available to the plant for uptake. Fixation by clays, iron oxides, aluminum oxides, free calcium carbonate and other soil components will inactivate much of the applied arsenic. There is no good soil test which can be used to tell the superintendent that he has achieved sufficient arsenic toxicity in the soil. Instead the superintendent must take into account the quantity of arsenic applied, the possible effects of the various soil constituents on this arsenic, and the visible symptoms of As activity on the turf.

In addition to the above soil factors the success of any arsenic program will be dependent on other considerations:

(1) The percent Poa annua present - In general, the more Poa annua present the more cautious the superintendent needs to be. Most turf managers desire gradual removal while overseeding with more desirable species.

(2) Time of application - early fall and spring are considered to be best. Avoid application if the turf is frozen, during high temperature stress periods and if excessive soil moisture is present.



(3) Correction of maintenance deficiencies - If the initial annual bluegrass encroachment was due to poor maintenance practices (overwatering, excessive N, etc), these should be corrected. If not, the control program may require more time and material and be less effective.

(4) Environmental stress - Any environmental stress which weakens Poa annua or more desirable species may alter their susceptibility to arsenic injury. Practices to reduce the chances of high temperature or excessive moisture are especially important.

To develop a safe arsenical program to control Poa annua the following are suggested:

(a) select a test area which is typical for your course. Apply arsenic at the suggested 1/2X, 1X, and 2X rates and observe the results over a growing season. This will allow you to judge whether the suggested rates should be altered to fit your unique situation.

(b) determine the soil texture, pH and phosphorus levels on your course. If pH levels are below pH 6.0 either lime them up or reduce the rate of arsenic to be applied. If you lime, do not apply arsenic for 6 months.

(c) If the Poa annua starts to go out faster than desired, there are three options. One, is to apply phosphorus to the soil. Except at very high phosphorus rates the reduction in toxicity will not be great nor very dramatic. Second, apply foliar applications of phosphorus. This will quickly counteract arsenic toxicity but must be repeated frequently. Third, apply 10-15 lbs. of  $\text{CaCO}_3$ /1000 sq.ft. This will tie up available arsenic quickly and for a long period of time.

-----

#### THE NECESSITY OF CART PATHS AND TRAFFIC REGULATIONS

William G. Buchanan, Eastern Agronomist  
USGA Green Section  
Highland Park, N.J.

There are more people playing golf today than ever before in the history of the game. Of the new breed of golfers, it would be very interesting to know how many of these people have actually ever carried their own bag or, heaven forbid, walked an entire 18 holes of golf.

Today the cost of a golf cart is generally considered as part of the cost of the game. You need clubs, balls, and a cart in order to play. It is not unusual to see clubs with fleets of 40 to 60 carts. Many clubs in the southern part of the country or western sections where golf can be played 12 months of the year have upwards of 80 carts per course. I had the opportunity several weeks ago to visit a 54-hole complex in Florida that had 280 carts available for their guests and



members. Granted that there are very few, if any, golf complexes or clubs in the Northeast that have this type of fleet, but this is an example of how things are going.

Golf carts come in every imaginable shape and size. Most of us have seen pictures of Bob Hope's cart that cost in the \$10,000 range. There are 2-wheeled hand carts, 3-wheeled hand carts that are electrically driven, 3-wheeled remote controlled carts, and of course the 3-wheeled riding carts and the 4-wheeled riding carts. Riding carts come either electrically propelled or gasoline powered, narrow tires or wide tires all have enough power to spin the wheels, and of course brakes good enough to stop on a dime. With all of these types of equipment there has to be something that suffers from their use, and that something is the turf. Several years ago the Green Section sponsored some research on the effects of foot traffic on the green. This was when the play on golf courses was reaching a point where foot traffic was becoming a problem. Now look at the problems with all this equipment running over the courses.

Since silver crabgrass won't stand up under the traffic, the only alternative is cart paths.

Paths are made of dirt, pine needles, wood chips, tanbark, peanut hulls, pecan hulls, sawdust, shells, concrete, sand, gravel and asphalt. Experience shows that no matter what surface is used a gravel subbase is necessary. The most popular and most economical in the long run appears to be 2 inches of "hot top" over 3 to 4 inches of gravel. One drastic change in the building of roads in recent years has been in the road width. Early paths were only wide enough for golf carts, but it is now common for them to be 8 feet or more in width. The reason for the wider paths is that, the paths are also being used by maintenance equipment as well as delivery trucks. Another reason for the 8-foot width is that, the paving machines are 8 feet wide and many times it is more economical to install an 8-foot path.

As with most large investments, we have to think of the purpose these paths will be serving 5 to 10 years from now. There is no doubt that a well-planned and constructed cart system will cost more than a system that just covers the bare minimum. But how many times will the lesser system have to be rebuilt or expanded over the years?

The hardest question to answer with cart paths is, "Where to end them?" The logical answer is 5 yards beyond where the traffic will do the most damage ...wherever that is.

Most courses are building paths after wear problems have already occurred so it is not too hard to see where the worn areas are. The trick is, once the paths have been installed to direct the traffic to the exit and enter so more worn areas will not appear. This can be done with "Y's", curves, movable barriers, signs, or combinations of these. Gentle curves flowing away from the intended flow of traffic has shown to be very effective in distributing the exit and entrance points to the paths because everyone will generally follow the "path of least resistance" and enter or exit where they feel is right.



Curbs are very effective traffic controllers, especially near tees. Invariably, you see worn areas adjacent to the paths where the golfer has pulled to the right side off the path to stop; subconsciously he is obeying highway traffic laws. A low curb in these areas will keep him on the path and save turf. We caution that the roadway should be lower in these areas so the top of the curb is level with the ground. This will save considerable wear and tear on mowing equipment.

A major flaw in path construction has been the lack of drainage considerations. Drainage must be planned so water will not drain where traffic is exiting or where the water will erode the end of the road. The other side of the coin is to use the roadways as drains. These paths require very careful design considerations.

In conclusion, golf carts are here to stay so maintenance programs better accept the fact. As long as there are golf carts and golfers, there will be a necessity for cart paths and traffic regulations.

---

#### HERBICIDES FOR TURFGRASS AREAS

Professor John A. Jagschitz  
Plant and Soil Science  
University of Rhode Island  
Kingston, R.I.

Control of weeds in turfgrass requires good turf management with the aid of chemical weed killers, called herbicides. Maintaining dense, vigorously growing turf will help prevent weed invasion. When grasses become weak and sod thins, weeds can easily take over. They come from seed that is ready to grow as bare spots develop. To make grass grow at its best one should use adapted and improved turfgrasses, properly fertilize, mow and water, control insects and diseases, reduce traffic, etc.

Herbicides can control most weeds but success will depend upon the proper selection and use of the herbicide along with correcting the cause of poor turf so new weeds will not take over again.

#### Correct Herbicide Use

Of the many herbicides available for weed control only a few are suitable for use in turfgrass. One must select the herbicide that will kill the weed and not harm the grass. Read the label and follow the directions and precautions for safety and good results. Careless use will be your fault and not that of the herbicides.

Using more herbicide than needed can injure the grass, however, sufficient material must be used or the weed will not be killed. Herbicides should be applied when the wind is calm so drift will not damage other plants. With sprays use low pressure and large size



droplets to reduce drift. Success depends on whether you follow directions. For example, if it says water or do not water after herbicide application, follow these instructions, they could mean success or failure.

There have been problems with turf fertilizer -herbicide combination materials. Often the problem was caused by using them as a fertilizer with no regard for the herbicide they contain. Severe damage can result if used in gardens, flower beds and around trees and shrubs. That extra feeding around trees and shrubs results in extra herbicide which can easily cause damage.

Consider each herbicide as a poison. Read the label. Be sure materials remain labeled. Follow the directions and precautions. Store them out of reach of children and animals. Do not contaminate foodstuffs or water supplies. Check laws and regulations in your area concerning the use of herbicides mentioned in this article.

### Soil Sterilization

Before a lawn is seeded one can begin weed control. There are fumigants that kill weeds and weed seeds in the soil. This is especially useful for weeds which are difficult to control after a lawn is established. This includes annual bluegrass, bentgrass, quackgrass, nutsedge, tall fescue, etc. Some of the fumigants in use are dazomet, methyl bromide, methan and methyl-isothiocyanate. They require warm soil temperatures to be effective. Depending on the material used and other factors, seedings have to be delayed for a few days to three weeks. Consult the label for rates and safe time intervals for safe seeding. The disadvantage of fumigation is that (1) the chemicals must be handled carefully as they can be extremely harmful and (2) their use can be costly.

### Complete Plant Kill

Weeds and all vegetation can be killed with herbicides prior to turf renovation operations. These chemicals persist for a short time in the soil and one can safely seed within several days. Materials such as cacodylic acid, paraquat and sodium arsenite are used for this purpose. Where plant kill is desired for several months and no seeding is contemplated, such as in parking areas, driveway, etc., one can use a mixture of amitrol plus simazine (3 + 9 lb/acre) or ammonium sulfamate (60-100 lb/A). Water then gently or work them into the surface soil layer so rains will not wash them into lawn or garden areas.

### Control of Weeds in Seedling Turf

It is not safe to use herbicides in new seedings or in seedling turfgrass until it is about six weeks old and has been mowed three or four times. Most of the annual broadleaf weeds such as ladysthumb, pigweed and ragweed will be eliminated during the first two months by regular mowing. However, for heavy infestations, one can use a herbicide



called bromoxynil (3/8 lb/A). It does not harm seedling grass and will control most broadleaf weeds when in the seedling stage. It is less effective as the weeds get older. A wider range of weeds can be controlled by using a combination of bromoxynil plus dicamba (1/4 + 1/8 lb/A).

Mowing will not kill annual grasses, such as crabgrass, that are serious pests especially in spring-seeded turf. If crabgrass is not controlled one can expect a sad-looking thin lawn in the fall. There is a herbicide called siduron, that can be applied to the surface of the seedbed after seeding and before crabgrass germinates and emerges. It is applied at the half-rate (6 lb/A) with a second application a few weeks later. The material will still do a good job if applied before crabgrass plants reach the 3-leaf stage or about 1/2" in height.

#### Control of Crabgrass in Established Turf

The best way to control crabgrass is with preemergent herbicides. They must be applied before crabgrass seeds germinate and the plants emerge. They do not kill established crabgrass plants. Crabgrass grows from seed each spring or summer and dies in the fall leaving seed for next year's crop. Application is suggested at the end of forsythia bloom and before lilac bloom, usually in April or the first part of May. Some herbicides may be effective if applied the previous fall, but best results are insured by early spring application.

Three herbicides have provided consistently good control with safety to most turfgrasses. These are bensulide (10 lb/A), DCPA (10 lb/A), and siduron (12 lb/A). DCPA, however, when used in fescue lawns may cause some thinning. Except for siduron these materials should not be used in seedbeds, on seedling grass or where reseeding is necessary within four months. Siduron does not appear to inhibit the rooting of transplanted sod and is still fairly effective if used before crabgrass plants reach 1/2 inch in height or the 3-leaf stage.

If one neglects to control crabgrass with preemergent herbicides there are several methanearsonates (DSMA, MAMA, MSMA, etc.) that can be used after the plants emerge. These are called postemergent treatments and are more effective when used on younger plants. Two or three applications spaced about ten days apart are required. Some turfgrass discoloration is likely to develop. If the crabgrass plants are less than 1 inch in height and have not reached the 5-leaf stage then a single treatment with a mixture of methanearsonate plus siduron does well. On putting-green turf phenylmercuric acetate (PMA) is generally used for postemergent control.

#### Control of Annual Bluegrass

When it comes to annual bluegrass (*Poa annua*) control there is considerable room for improvement. Possibly with careful and continued use some of the products available may be effective. There are materials such as bensulide, DCPA and tricalcium arsenate that are used for pre-



emergent control. Materials such as maleic hydrazide (MH) and chlorflurenol (CF) are used to prevent seed and reduce plant population. There are also many management practices that can be used to discourage annual bluegrass and promote the desired grasses. It appears that there is no simple or easy method for annual bluegrass control at this time.

#### Control of Broadleaf Weeds in Established Turf

Broadleaf weeds are best controlled in early fall or in the spring. In early fall, the grasses can easily fill the voids before crabgrass season the following summer. To get the best control, without turfgrass injury, the weeds and grass should be growing well at the time of treatment. Herbicides applied during drought or hot weather may injure the grass. Do not water or mow for at least 24 hours after treatment to allow the herbicide to enter the weed and kill it.

Broadleaf weeds such as dandelions, plantain, chickweed, etc., are best controlled with postemergent treatments. 2,4-D (1 lb/A) will readily kill common weeds such as dandelion and plantain but it is not very effective against weeds such as clover and chickweed. To control these one uses dicamba, mecoprop or silvex. To control most all of the weeds a mixture of 2,4-D with either one or two of the following is suggested- dicamba (1/8/A), mecoprop (1 lb/A), or silvex (1/2 lb/A). Combinations containing dicamba are very effective but require cautious use under trees or shrubs where root uptake may cause damage. Mixtures containing silvex may cause injury to bentgrass.

In putting-green turf one can use dicamba or mecoprop to control clover, chickweed, or pearlwort. If knotweed is a problem in lawns use a mixture containing dicamba. Prostrate spurge may best be controlled with mixtures containing silvex or two applications of various mixtures.

#### Eliminating Harmful Herbicide Effects

Where toxic herbicide residues exist in soil and prevent the normal growth of grass seedlings one can add activated charcoal and make safe seedings. The activated charcoal (300 lb/A) can be applied in water (500 gal/A) as a spray and then raked into the soil. Some of the chemicals that have been affected are as follows: 2,4-D, dicamba, mecoprop, silvex, bandane, benefin, bensulide, DCPA, nitralin, simazine and terbutol.

Charcoal has also been successfully used on established turfgrass to reduce injury from herbicide misuse, over-dosage or spillage. The sooner one can apply the activated charcoal the better the chances for success. Good results have been obtained where chemicals such as 2,4-D, 2,4,5-T and silvex have been improperly used.



## PERSPECTIVES ON LAWN MAKING AND KEEPING

Dr. Robert Schery, Director  
The Lawn Institute  
Marysville, Ohio

These are interesting times in the lawn and turfgrass world. To use a trite but expressive phrase, "It's a whole new ball game." Many changes have come, and others are still evolving. I think that three especially manifest forces are operative:

1. Widespread environmental or "ecological" awareness.
2. A rich assortment of new cultivars - especially bred proprietary varieties.
3. The coming-of-age of specialization; expectation of convenient products giving "instant" success, unencumbered with complicated whys and wherefores.

### PERSPECTIVES

Seeking "big picture" perspectives, details highly important to those engrossed in their research may seem slighted. If I ignore such things as the influence of potassium on turf diseases and turf wear, or the meticulous soilbed preparation recommended in standard homeowner advisories, it is simply that for the majority of lawns these are instances of overkill. Not only such matters largely be ignored because most of us are mere human beings, but I am not sure that their capitalization could be justified in any event were a cost-benefit economic analysis undertaken.

Of course, it is another matter with professionally tended turf, such as for golf courses, where pressures for perfection are great, and, within limits, budget and talent are provided to achieve the ultimate. Even then I am reminded of early experience with the St. Louis baseball stadium. A new stadium has now been built, and compared to the old grounds budget, fantastic expenditures have been allowed for maintenance. Following consultant recommendations, huge investments were made in drainage, soil compounding, irrigation, even temperature control. Yet one failure after another resulted until management called a halt and put in Astroturf. Yet, in the old stadium an acceptable if not good playing surface was maintained most of the time at reasonably little cost. For special dress-up, as when the club changed hands, the field could be sodded to pasture bluegrass cleaned up with 2,4-D (there was no cultivated sod industry in those days). This was pretty rugged grass, and though no great shakes in summer was resplendent in spring if provided considerably high mowing.

When the team acquired spry young outfielders and wanted a fast field, low mowing made life difficult for bluegrass. But there was always volunteer crabgrass and goosegrass through summer (and common bermuda,



which doesn't survive winter, could always be overseeded to bolster thin turf). When the field was also used for football in the autumn the situation became even more difficult. Yet ryegrass bolsterings in late summer helped thicken the bluegrass as crabgrass waned. Not that I recommend this sort of field for today, but it does point out that there are simple, low-budget ways as well as complicated, costly ventures. Sometimes the end result of extravagant spending is not sufficiently that much better so as to be justified?

#### CONSEQUENCES OF CHANGING ATTITUDES

As I see it, a minority of homeowners will be more "independent-minded" than ever, and not give a hoot about conventions. They may let their grounds follow a natural bent with minimum maintenance, and have scant inter-relationship with turfgrass interests.

But the majority are likely to be more particular than ever, made more "aware" of lawn and garden through increased educational and promotional efforts. They will expect superior performances from lawn-grasses and lawn products, with cost somewhat secondary to accomplishment.

This should lead to expansion of contracted services, which have already made great inroads in some parts of the country. Worthwhile end results are then anticipated, but details are left to the experts.

However, for labor-intensive operations such as lawn mowing, people of average income will be hard put to find competent service. They will want more capable and sophisticated equipment, and products to make their own labor "go farther." Assuming no economic depression, effectiveness and convenience can be expected to outweigh cost.

#### MEANS TO THE END

Lawngrass Cultivars - Until quite recently lawngrasses were little more than cleaned-up pasture species. I don't mean this derogatorily, because through natural selection in the pastures and meadows these were a durable, recuperative lot. Yet they are not tailored for fine turf, -- not selected for disease tolerance, for full-season performance, for performance under consistent low-mowing, for attractive color and texture, and so on. Improvement on all of these counts has been made with lawngrasses especially bred for fine turf and not pasture, cultivated for seed and not forage. Note the lengthy list below of improved lawn varieties approved by the Lawn Institute Variety Review Board in 1972 as having special merit. Many are not superstars, but fill a regional need or are serviceable in mixtures.

Kentucky Bluegrasses - Attractive with moderate care, spreading by rhizomes; basic for general use. Need good soil, sun or sparse shade - *Adelphi*, *Arboretum*, *Arista*, *Baron*, *Bonnieblue*, *Fylking*, *Merion*, *Nugget*, *Pennstar*, *Prato*, *Sodco*, *Sydsport*.



Fine Fescues - Dense and fine-textured in cooler months but often erratic in warm, humid weather; adapted to shade, low fertility and dry sites; less vigorous than bluegrass and often are not so tolerant of careless mowing and chemical treatments; much used in combination with bluegrass. - *Highlight, Jamestown, Pennlawn, Ruby.*

Bentgrasses - Fine-textured grasses much used for golf greens and fairways, best in humid climates. Bentgrasses need consistent and frequent mowing, irrigation, fertilization, thatch control to look their best. Colonial bents are less demanding than creeping or velvet sorts. - *Exeter, Highland, Holbfior, Kingstown, Penncross.*

Perennial Ryegrasses - New fine-leaf turf-type varieties are now available, hardier, more disease-resistant and attractive than the common type. Quick sprouting, make quick cover; not as reliable as bluegrass in either hot or cold weather, mow less cleanly and are unable to spread by rhizome or stolon. Used as a nursegrass in mixtures, as winter cover for dormant southern lawns, for reseeding worn athletic fields, and for pure stands in steady coastal climates. - *Compas, Manhattan, NK-100, NK-200, Pelo, Pennfine.*

---

The surge of interest in the new perennial ryegrasses, formerly not a name to thrill a fine turf devotee is especially noteworthy. Now having better looks and durability, perennial ryegrasses are finding considerable use where a fast catch is needed, or an improved substitute for the old time "nursegrass" is wanted. Even in bluegrass's heartland a bit of perennial ryegrass may find a place in lawnseed mixtures, although in general ryegrass is best reserved for special purposes and areas for which a bluegrass-fescue combination is at some disadvantage.

Awareness of the disadvantages that come with monoculture, especially for the non-expert, is increasing. Seed mixtures tailored for local conditions have advantages over the planting of but a single variety. Availability of an increasingly large assortment of new cultivars can be expected, resulting in heightened interest in proprietary seed mixtures with improved varieties.

#### CULTIVAR CARE

If tailored cultivars are to be backbone for lawn sowings and sod of the future, tailored care is equally in order to bring out the best in these lawn beauties and to "protect the investment." Keep in mind that the modern varieties were bred in expectation that the lawn would receive reasonable care; they were selected at research centers where the turf receives at least occasional intelligently-timed fertilization and a modicum of pest control. Although by and large vigorous and aggressive, the new cultivars are not designed for no-maintenance awards. Briefly then, what do they portend for lawn care?



Fertilization - Fertilizer has always been one of the best, least-expensive tools for regulating the lawn population. Depending upon when and how you fertilize, you can throw the advantage one way or another, -- towards the lawngrass favorite, or towards its competition. And as with tailored cultivars, the age of tailored fertilizers impends, especially for the homeowner not skilled in lawn ecology and expecting fool-proof results.

There are two general categories of lawns requiring somewhat different fertilization emphasis. Those planted to the new cultivars will be reasonably disease-resistant and adapted to consistent fertilization. With these a steady fertilization program is appropriate no matter the season.

On the other hand, many lawns contain traditional lawngrasses. These grasses are not too resistant to warm weather diseases, which are intensified if the grass is forced into lush growth in hot weather. At least in the lower portions of the bluegrass belt traditional lawns that are lightly fertilized in spring and summer (although profiting from a good boost in autumn) always seem to do better than those which are generously fed in summer. Indeed, in many cases those fertilizers rating best were actually inefficient, much of their nitrogen being volatilized in hot weather.

Fortunately there is now available for turf an assortment of "slow-release" lawn fertilizers, most of them incorporating a sizeable percentage of ureaformaldehyde (UF) nitrogen. Because the nitrogen is parcelled out slowly and evenly as the polymer is broken down by the soil microorganisms, the effects are good for both categories of lawns. With the new cultivars UF nitrogen supplies the necessary feed-out for attractive color and moderate growth season-long, and with the traditional types of lawngrass does not force lush summer succulence.

Without going into details here, I do think that a great future lies ahead for tailored fertilizers incorporating slow-release components, the exact formulation, of course, tailored to the local soil and climatic needs. Invariably nitrogen will be needed for turf, but little or much potassium, phosphorus, trace ingredients, and so on, depending upon conditions.

Mowing - By far the greatest labor input in lawn tending is mowing, and it is increasingly difficult even to get "the kid down the block" to do it, no matter the hourly pay. No wonder interest is increasing in top-quality mowers that have the capacity to complete lawn mowing quickly and without frustration. For lawns of any size, we should see more and more well designed riding vehicles, -- ones that service simply, adjust easily, maneuver well, employ flotation principles, and have a variable forward-backward speed independent of the cutting blade. The thrust will be towards making mowing a pleasanter task, -- something recreational rather than laborious. One thing likely to be forced upon the mower industry is noise reduction, heretofore one of the neglected phases of design.



Irrigation - Lawn irrigation is increasingly necessary in order to meet the high standards expected with newer turfgrass cultivars, and no longer solely a concern for arid climates. On the other hand, many people expect miracles from irrigation, and must be educated to the fact that watering, especially when improperly practiced for the particular soil, grass, and climate, can bring problems with it. Keeping a lawn continuously moist has its ecological consequences! I anticipate that we will see many more underground systems established, most of them activated by automatic controls, following the lead of golf courses and other professionally managed turf installations. A great opportunity would seem to lie in quick, competent installation of systems sufficiently small and inexpensive to serve the typical home lawn.

Weeds and Other Pests - While there will always be need for chemical pest control, other methodologies seem likely to gain emphasis because of environmental concern. Fortunately, many excellent herbicides to control the majority of lawn weeds are available, seemingly not prime candidates for further banning. What with admissible phenoxies, dicamba, arsonates and various pre-emergents it is possible to protect a lawn against most weeds other than perennial grasses. As expensive as it has become to perfect and introduce a new herbicide, fewer new lawn products can be expected unless the same chemical serves a wider field. Restrictions and a "bad press" have already made it difficult to secure several highly useful and essentially non-toxic herbicides, however. For most needs non-toxic biodegradable materials can be found, and though there seems to have been overreaction against chemical usage the situation can be lived with. The chief disadvantage may be a lack of incentive to seek out and develop ever more effective products.

For disease control systemic fungicides of the benomyl type have much to recommend them. Still, the biological approach of planting disease-resistant cultivars seems the more sensible means for thwarting disease. In spite of very meritorious work by pathologists in developing fungicides and working out application details, we have felt that this technique is more for the professional than for the amateur. First of all there are so many variables affecting onslaught of disease that even professionals are uncertain about effectiveness. In many cases change of weather or some other natural phenomena is more important than is application of a fungicide. Moreover, it is beyond the interest and capacity of a homeowner to complete the precise and repeated applications needed for really good disease prevention with a fungicide. And now even the question of whether some fungicidal treatments so unbalance the myco-ecology so as to cause serious consequences from another ill has arisen. There seem to be instances of this in thatch control too.

So far other chemical regulants, such as growth-control materials, have not set the world on fire. As with disease prevention, a negativism prevails that lacks appeal. It is easy to see a technique such as fertilization, where the benefits are clearly visible, less easy to convince someone to "prevent" something that has not yet appeared (and



may not). While there is no question that some growth regulants such as ethrel can stimulate tillering in certain turfgrasses, the advantage to an already dense lawn may or may not be consequential. With most of the growth retardants value has been minimal considering the cost and delicacy of the operation. Even when growth control of the grass can be achieved, it may not affect all species equally, nor can uniform rates to all vegetation be assured; late-sprouting weeds, unencumbered by the restraint, may actually gain at the expense of the turfgrass.

#### A FEW OTHER THOUGHTS

Diagnosis - Plant-growth diagnosis has generally improved in recent years. Not only is soil testing more experienced, with significance of results using various reagents better understood (even permitting estimate of nitrogen needs), but improved instrumentation allows "quick-test" investigation of matters that were formerly quite cryptic. Technology is on the verge of distinguishing cultivars by means of protein extracts (disc electrophoresis), and carbohydrate extractions provide clues to such practicalities as habitat suitability and thatching proclivity. Instruments are available for chromatography, atomic absorption, emission spectrography, X-ray fluorescence, electron microprobing, and neutron activation. So far not much that has practical application to lawn tending has been revealed, but the means of exploring hidden physiological qualities is at hand.

By and large turfgrass does not often suffer deficiency disease, but it is becoming possible better to assess soil balance and tissue nutrient content (how often does application of one element dilute that which is next limiting?). Influence of the secondary elements has been pointed up, such as for sulfur in Florida, and better techniques for determining sub-critical levels of other nutrients is at hand.

Aerification - Because the logic of providing greater gas exchange by punching holes into the soil for the benefit of grass rooting is so appealing, aerification is widely practiced. Where ground suffers compaction, such as on trodden golf greens, there must be advantage. Deep aerification has been proven useful on heavy soils in the Southwest, too. However, for the general run of lawns, especially in climates where winter freezing loosens the upper levels, the typical spiking of a lawn is probably doubtfully useful (except as it might loosen thatch). I wonder if aerification has not been oversold in lawn-tending, its advantages not being commensurate with its inconvenience and costs?

Thatch - Perhaps thatch and its control have also been overdramatized? Oftentimes thatch control is looked upon as a cure-all, for everything from ineffective product performance to prevention of diseases. Undoubtedly instances occur where thatch limits lawn performance, but on the other hand many lawns, even of such thatching species as Penncross bentgrass, survive nicely without thatch removal (often exhibiting reduced weed incidence therefor). Space does not permit going into



the ecology of thatch formation, but it is worth remembering that thatch is the natural ecological outcome from forced growth kept immature and in a highly productive ecological stage, as occurs with most lawns. Perhaps we should learn to live with thatch more comfortably?

Shade - Widespread testing is underway on turfgrass shade performance. "Shade specialist" cultivars may join those tailored for other uses, regions, or preferences. However, lack of sunlight does not always limit performance in shade directly. Michigan research suggests that shade tolerance is more a matter of disease resistance than inability to survive under a regimen of reduced sunlight. Texas research shows marked cultivar variation in shade tolerance within a single species. Perhaps systemic fungicides, improved fertilizers, less detrimental mowing, or other manipulation of management procedures, is more the answer for shaded lawns than is the selection of new varieties? Would liberal use of slow-release fertilizer combined with infrequent high mowing stand present cultivars in good stead under trees?

-----

#### STADIUM TURF MAINTENANCE

George P. Toma, Director  
Field and Landscaping  
Arrowhead and Royal Stadiums  
Kansas City, Missouri

Good afternoon, fellow turfmen ... I appreciate the opportunity to be here on behalf of the University of Massachusetts Turf Grass Conference. This is a very nice turnout. Whenever I have the opportunity to speak to a group of athletic field turf managers, and as I look across the room, I think to myself and say, "Gee!" I sure wish there could be two or three times the amount of people here. And, for this reason ... it would be so nice if two or more members from your organizations came along. The members that I would like to see at all of these turf meetings are: our stadium managers, business managers, general managers, the heads of our parks and recreation departments; and, yes, even the owners of amateur and professional teams. If we could get these people to come along for a day, it would be so worthwhile for all of us concerned with the care and management of athletic fields. Many times our turf programs have to start with these people. I believe many times there is a communications gap between all of us in our organizations when we propose to try to better our playing fields. Here is where natural grass suffers. Those higher up in command attending would get a better idea of the problems we face and what we can do to correct these problems for the betterment of our playing conditions. In doing this, we can show them ways of saving money, or at times a few more dollars could give them a playing field that is superior to artificial turf. The only time many of our supervisors become concerned about our playing fields is when it rains or the grass doesn't look good. They become really concerned when it is raining. Perhaps a doubleheader is on tap, plus a near sellout.



The field is saturated, and they become very jumpy. They wish to do everything possible NOW! Even bring in helicopters at \$75-\$100 an hour ... tomorrow the sun comes out, and everything is forgotten until it rains again for a big game. Still, we never could get them to down to brass tacks to remedy the situation. They may bring in helicopters at a vast expense, and this is not the answer. The answer is to get them thinking. If we could get them to understand our soil, turf and equipment problems, then we could start on our maintenance programs. Money was available for a helicopter, but it is not available for some type of drainage, or perhaps the purchase of an aerifier to eliminate the problem of a wet compacted playing field. I know what some of you men go through because groundskeepers are dedicated men, and without the proper equipment, it makes our jobs really tough. Never give up... you still can have a respectable field on a very low budget.

In Kansas City we did not have drainage --tile that is -- our water had to go 300 feet instead of 15 feet. We did not have the proper soil. Some agronomists called it the world's worst. But, we managed even without an irrigation system until three years ago. It seems in many places natural grass is on welfare, while artificial turf is living with the kings. People expect too much from natural grass and in return give it too little. Many of us groundskeepers never had a good aerifier. Round figures \$500... artificial turf water removal machine \$12,500-\$23,000. For a grass base we have to take what is there - artificial \$400,000... good grass mower \$1,000... artificial vacuum \$4,000. We are poor natural grass salesmen. Artificial turf made fools out of us. But, time is catching up with them. I have asked one artificial turf company publicly to refrain from advertising their product, which many of you have seen in magazines, where there is a photo of a football game played in mud. The players are totally covered with mud. That poor groundskeeper is outmatched. He never spent \$400,000 for a base or \$375,000 for the grass, and he never had an aerifier. I have seen one of their fields with this \$400,000 base, and when it rains, as one nationally famous football coach put it, "it is not even fit for ducks to play on." Their injury list is a farce. In nine years in Kansas City on a very low budget we had only one leg injury. In one game on artificial turf, we had four, in some places as high as seven. What we have to do is a better selling job to our people, and we have to do a better job in care and management of our playing fields. Artificial turf is not the answer. Let me say this .. if one has a poor natural grass field and switches to artificial, you can bet your boots you are going to have a poor artificial turf field. Always try to better your playing field.

On Saturday, January 13, I was standing at the entrance to the playing field at the Los Angeles Coliseum, and the Miami Dolphins came running down the players' tunnel on to the playing field for a brief workout. As the players hit the turf, you could hear them say, "Great!", "Superb!", "Thank goodness for REAL grass!" It seemed that they were happy to be playing on real grass after all their problems with their fake grass. It seemed to make them happy, and I would venture to say



that their happiness from working out on natural grass led them to be World Champions the next day. I do not wish to knock artificial turf. But, to our bosses --please give natural grass the attention you give artificial turf. We groundskeepers are not asking for the hundreds of thousands of dollars as in artificial, but just a few hundred or thousand for a little drainage, or soil - a change to a new variety of turf and equipment. We do not need that near one million it takes to do a baseball field with artificial. In care and management of turf, it starts at the top, and if we could bring these people with us, they would understand natural grass. If they don't, it is up to us to do the best we can with what we have to work with. Most of all, we must be concerned with the condition of the grass at all times.

For athletic fields we will be looking for a turf grass that is tough, wear-resistant, and one that is not easily torn up by cleats. Still, it has to be soft enough to prevent abrasions and firm enough to permit good footing. There are many good turf grasses on the market today, especially for athletic field use. Our agronomists have done an excellent job with our low cuts. I have had excellent results with the poor-house grasses that were superior to artificial under very poor budget and growing conditions, and I am talking of common Arizona Bermuda and annual rye. But, Bermuda cannot help you people in this area. I have had excellent results under the same conditions with some low cuts as Merion, Fylking, Windsor and A-20 Prato. There are good ones in Adelphia, Penn-Star and many more on the market. In tough spots I have overseeded with Manhattan. There are also Penn-fine, NK-100, Pelo, and Norlea and Game. A-20 has done an excellent job for me in wear and tear areas. For athletic fields I always like a blend for I believe it is turf grass insurance. In a blend I like to use three or more grasses. In choosing our grasses, we are looking for one that is firm enough to permit good footing but also one that could be clipped short enough and yet tall enough for good growth and to prevent the hanging of cleats .. and one that will have rapid recovery from injury. To establish our grass we should seed or sod as early as we possibly can. If we are going to sod, let's pick out the grass we want and talk over the pre-sodding management program with your sod dealer. Many of our sod men now handle our new low cuts by themselves or in blends. If we do not sod, we can incorporate our new varieties into our present turf especially with some of the new equipment on the market today. I like to use the aeroblade drill seeder. I have had excellent results with this machine. If this machine is not available, we can use a power rake, verti-cut aerifier, or pin spiker to incorporate our seed.

If one runs into trouble during the playing season, we can use our grass in reserve, that is rye grass. If possible we should use a rye grass that is compatible with our blue grasses such as Norlea, Manhattan and Pennfine strains since they are darker in color than regular domestic ryegrasses. During the season, if needed, I pre-germinate rye grass and mix it with soil to be planted after a baseball or football game. I have



done this also in freezing weather. Dick Erickson of the Minnesota Vikings and I in the past would do this on our last baseball game, which was usually on a Sunday. On the following Sunday we had grass for our first football game in a multi-purpose stadium. Here we would pre-germinate the rye grass by placing the seed in 55 gallon barrels with nail holes on the bottom with wooden pegs to let the water out twice daily. The seed would soak for 72 hours replacing the water twice a day. On a Friday the seed would be dumped on a concrete floor to dry. On Saturday the seed would be mixed with milorganite or perlite to help facilitate the handling and be ready to seed on Sunday. In the preparation of the dirt infield, baselines, mound and homeplate, we would scarify lightly using a nail drag for we wish to retain the firmness and even footing from the baseball infield. Now hold on to your hats --one must seed this between 40 and 60 pound per 1,000 square feet. This would cost near \$100. If one sods, it will run near \$1,000, for there would be more soil preparation and machinery required. The seed would be put down after the game Sunday using a nail drag or rake it in lightly..roll with a light roller and water good, followed by keeping it moist but not saturated. On Tuesday, I would top dress the area lightly if needed. To hasten the germination, one can cover the area with polyethylene. This proved advantageous in the Super Bowl game this year for the field was moved in 20 yards to an area with no grass. On Friday or Saturday we would use a greens mower full roller and mow at one inch. Results were always great. We had the green color that we needed and the footing came from the firmness left over from the baseball dirt portions. If one sods an area like this or any part of a football field during the season, gentlemen, it can be done now and you can play on it as soon as you remove your equipment. Usually sod men cut their sod for delivery 18" x 72" with a half-inch of soil. This is great when you have a month to go or so and the grass has a chance to knit, but when you have an hour or a day, it will not work. It will work if you do this, and it is guaranteed ... have the sod man cut the sod 18" x 36" with 1 1/2 to 2 inches of soil. I have sodded like this and never had a piece come up. A few years back in the Orange Bowl for a Super Bowl game we sodded areas of the center of the field on Thursday and Friday and played the Super Bowl on Sunday with no grass problems.

Also, in the care and management of our fields we also must look at it from a spectator's standpoint. It is a satisfying sight to see a beautiful playing field for the players and sports fans and especially now since nearly all sports events are shown on color television. With our grass we must work for uniformity and compatability in color. Many little things can be done to improve the looks of your field by special grooming. For big games painting and decorating your end zones will bring out the color. A little nitrogen applied a week or so before the big game. In Kansas City we mow the grass all year in a way to get a checkerboard effect. This is all done with a reel mower. For football we mow every five yards in an opposite direction giving that light/dark effect. If one does not have a reel mower, he can accomplish this by brushing the grass a few times with a street broom or by dragging a steel door mat. Grass colorants can also be used. One can use two different trademark colorants or dilute one lighter or heavier to attain the light/dark effect. Also, in our maintenance programs, we must culti-



vate our grass by fertilizing, watering and mowing. These three are very important for good healthy deep-rooted turf. It may cost \$40 to rent an aerifier or purchase one for \$500, but it will do a good job to relieve compaction and get water and air down to the root zone, and it does a better job than a \$12,500 or \$23,000 water removal machine. Aerify often and especially on the heavy side after the playing season is over.

Before we start our fertilization program, we should have a soil test yearly. With the use of our new low cut bluegrasses we need to apply a few more pounds of nitrogen per year. We should try to have a pH of 6.5 to 7.0, which is great for athletic field turf. Watering is very important. Grass must be watered on the basis of grass needs. It may need a good watering especially on hot windy days, a few light syringings. If you have been keeping the water off your field during the football season, be sure to water the turf good after your last game to help prevent winter kill. Fertilization, water, along with aerification play an important part in growing deep-rooted healthy grass. With the low cut bluegrasses on the market, we can afford to mow our grass shorter. Two important things to remember in mowing: (1) If you do not have time to check the sharpness of the reel blades or rotary blades, gentlemen, you just don't have time to mow. During the playing season in Kansas City when the team is home we mow every day. So, our blades are checked every day. (2) Try to remove only one quarter of the leaf surface at any given mowing. All of the above play an important role in care and management especially the M-A-N in management.

Back in the early 1950's in Pennsylvania at a conference like this, I heard Dr. Cooper and Dr. Musser say the cheapest insurance for an athlete is a good playing field. Consult with your state college agronomists..they are our books of knowledge and will lend you an ear on better ways to establish and maintain athletic field turf. Natural grass is cheap compared to artificial turf. We must make changes at times for the betterment of natural grass. A major change could run \$500 to \$1000, which is very cheap compared to artificial turf. If one sits back to realize every artificial turf installation today after many years is experimental, and people putting it in their stadiums today are paying a high price to these companies --some quarter to a million dollars to experiment with their product with your money. I could tell you many problems arising from artificial turf, and so can many other grounds-keepers in college and major league stadiums. But, many can't because they have been censored by the higher-ups because it cost a lot of money to put it in. In Kansas City I would not accept the baseball installation, which cost nearly one million dollars. Perhaps this company has a cement overcoat for me. When I purchased sod for 35¢ a yard, the sod grower replaced a piece I did not want. But, in artificial turf, for, say, \$35 a yard it is hard for them to replace a defective piece or roll.

In Kansas City in 15 years I only used a weed killer one time. If



we can establish good turf that is our best weed killer. Fungicides, say a half dozen times, but since I guess we had some good looking turf, I got a visitor once in a while from Mr. and Mrs. Sod Web Worm, so we have to have an insect control program.

So, as I come to a close, I hope you could see why I mentioned that I wish you had brought along your high-ranking officers and I hope that you have picked up a few things on care of athletic fields so this year and every year we can say, "May all of your good fortunes throughout the year be as numerous as blades of grass on my playing field."

-----

#### HIGHWAY TURFGRASS

Professor Robert W. Duell  
Soils and Crops Department  
Rutgers University  
New Brunswick, N.J.

Highways today are more than merely a means of transportation for us. They constitute a large and more important part of our environment today than ever before. More people are traveling more miles on our highways and are more critical about what we are doing to their environment. Initially, erosion control was oriented primarily toward agricultural pursuits. Highway engineers soon learned that erosion control measures were essential to safeguard the road and its structures. There was an extension of basis agricultural techniques to roadsides. Woody and herbaceous species play a role in vegetating roadsides, but grass is the vegetative form that generally serves best. The problem is a vast one, as the following slides illustrate. These slides are from various sources in several states, so the views don't necessarily relate to the New Jersey Department of Transportation.

1. Our roads traverse every imaginable sort of terrain, from fertile valleys to rugged hills and mountains. Soils and plant growing conditions change not only as we go down the road but may vary at any one particular point along the road.

2. Roads cut through hills reveal soil profiles laid down in various geologic eras. Plant growth response will differ markedly in these strata.

3. Plant growth response will also vary along our roadsides depending on the exposure of banks. Southwest facing slopes receive more solar energy, warm up and dry out faster than northeast facing slopes. Seedling establishment and growth are usually inferior on the warmer slopes.



4. The steepness and the size of the bank relate directly to the difficulty in establishing vegetation. This is mainly a matter of water loss that carries with it seed, nutrients and the more important fine, less dense particles of the soil.
5. Roadside banks left unsown soon develop rill erosion. This is an all too common sight.
6. Rill erosion leads to gully erosion, quickly filling drainage ditches.
7. Silt and sediment are carried into our streams, polluting our water and reducing its usefulness. The carrying capacity of streams is reduced, and the likelihood of flooding is increased.
8. Flood damage includes silt deposited over valuable land, often reducing its usefulness.
9. Roadsides with inadequate vegetative cover and having soils of uniform particle size are particularly prone to slumping or slippage of banks which leads to further erosion and need for repair.
10. If soil embankments have set for a period of time, incorporation of lime and fertilizer in the soil becomes more difficult. One of the popular tillage implements for use on banks is a chain with spikes through the links as illustrated here.
11. Excessive traffic by heavy vehicles over fine-textured soils may result in a severely compacted surface which could impede the establishment of roadside grasses.
12. In some states topsoil is used to cover the primary grade to a depth of 4 inches. Bulldozers push the topsoil over the primary grade.
13. Further leveling of topsoil along roadside banks is accomplished by dragging a heavy chain over the surface repeatedly until smoothed.
14. Handraking is sometimes employed to further finish the surface of banks. Excessive smoothing of banks may increase the volume of run-off following heavy rains. This in turn would result in a loss of seed and fertilizer. Eutrophication, the enrichment of bodies of water, is then enhanced.
15. Hydro-seeding is a popular means of applying seed and fertilizer and occasionally fine fibered mulches to roadsides in a single operation. Even with careful operation, voids may be left and a second and possibly third application is often warranted. Seed and fertilizer remain on the soil surface.



16. Rolling with a corrugated roller insures better seed-to-soil contact. Note the better emergence of grass seedlings in the depression left by the roller and the depressions left by tractor tire treads.

17. Mulching conserves moisture and moderates temperatures. A widely used technique in mulching roadsides is the chopping and blowing of hay or straw with special equipment. A uniform application covering approximately 75 to 85% of the soil is desirable. This is equivalent to 2 tons of hay or a ton and a half of straw.

18. Hay or straw mulch must be secured or it may wash or blow away. Heated liquid asphalt, either the emulsion or cutback, is sprayed over the surface with specialized equipment. Rates approach 200 gal/A, or 0.4g/yd.

19. In more precarious situations heavier rates of liquid asphalt "tacking" may be applied, such as 360 gal/A, or 0.75gal/yd. In addition, strings may be criss-crossed over the surface to aid in retaining the mulch.

20. Where guard rails, curbs, signposts, etc. exist at the time of the tacking, alternatives to asphalt such as clear non-staining organic adhesives may be sprayed over the surface, using a hydro-seeder. These products are usually more expensive than asphalt, but one machine may be used for 2 types of application.

21. Hay and straw mulches vary appreciably not only in color and texture but, more importantly, in seed content.

22. Various grasses and broadleaf weeds may volunteer from trashy mulches. The grasses can generally not be selectively removed from the sown species with herbicides as the broadleaf weeds may be.

23. Volunteer grasses may completely mask the sown species.

24. If a species such as orchardgrass volunteers and is not mowed early enough its seed heads may obstruct the vision of motorists entering a traffic circle and mask the beauty of the rugosa rose planted in the median.

25. Barnyardgrass may volunteer profusely from the mulch (or possibly the topsoil), and mask the sown species. This is particularly competitive to late spring seedings.

26. Foxtail millet may have the same effect.

27. The result may be a very sparse stand of sown species.

28. Where drainage must be conducted over the face of a bank the placement of sod in depressed waterways may safely conduct water down the face of a bank to major outlets such as an asphalted ditch.



29. Proper grading is necessary to insure against the impounding of water above the slope that may eventually wash through and destroy portions of an otherwise properly mulched bank.

30. Large exposed areas of roadside banks may have hay or straw mulch blown from them or the mulch may slide down steep hillsides. While the upper portion of the bank dries out moisture accumulating at the toe of the slope promotes a luxurious growth of grass.

31. Soil surfaces covered with hydraulically applied paper fiber mulch may actually accumulate fine soil particles blown from adjoining areas.

32. Synthetic soil stabilizers are temporarily effective in preventing the blowing of soil.

33. Untreated soil looses much of the fine particles from its surface under windy conditions.

34. Having seen the need for vegetating roadsides, and the problems encountered in establishment, we should now look at the various grasses used, the management imposed, and also consider specific plant materials.

35. Many of our roadsides are dominated by tall growing forage type grasses that require a lot of mowing to maintain even passable appearance.

36. It would be more reasonable to establish vegetation initially that would appear homogeneous and acceptable --perennially, than to mow repeatedly in an attempt to obtain homogeneity and acceptability --temporarily.

37. Tall fescue dominates many roadsides, and where growing conditions are favorable, and mowing is timely, appearance is acceptable. On unmowed banks, its seed stalks, like those of other forage grasses, constitute a major negative feature of our grassy landscape when they dry because they remain standing for many months; sometimes essentially the whole year!

38. Close mowing of a tall grass, particularly at the beginning of a dry season, may result in severe browning. Regularly mowed Kentucky bluegrass may be appreciably greener in comparison.

39. Tall fescue may be depleted from a mixture on a mowed bank which sheds some of its rainfall, but it may persist in the valley that receives the extra moisture.

40. Frequently the fine fescues persist on this sort of a bank. They may, however, be clump-forming grasses such as the Chewings-type red fescues, and not provide complete soil coverage.



41. Or, they may be spreading red fescues. Some of these older banks dominated by spreading fescues have not been mowed for 20 years.

42. Color retention most months of the year is good, as is weed exclusion and general appearance of some of these old roadside banks.

43. Along certain roadsides we have found a number of distinct clones of vigorous spreading red fescues.

44. Some clones are denser and darker than others.

45. When cultivated and fertilized in a nursery these spreading types were vigorous, rather disease resistant, and good seed producers.

46. Seedlings of spreading-types are notably more vigorous than those of Chewings type.

47. The progeny of spreading-types are longer leaved and retain more green color during summer drought than do Chewings-types.

48. They also compare favorably with K-31 tall fescue on the basis of color retention.

49. Another interesting grass with potential as a roadside grass is C-26 hard fescue. It retains its color well, but because it is short leaved it can be masked by taller growing components of mixtures such as long leaved Kentucky bluegrasses.

50.. Among the commercially available creeping red fescues, Pennlawn is perhaps the most widely used. Its color under a no-mow management is usually inferior to that of Ruby creeping red fescue.

51. Following a summer drought Ruby appears superior to Pennlawn.

52. and this advantage is retained on into December.

53. Ruby is a long leaved grass and soon develops sufficient cover under a no-mow management to suppress seed stalk development. Highlight, a Chewings variety produced many seed stalks under similar conditions.

54. Eventually, most varieties of red fescue growing under productive conditions may accumulate sufficient topgrowth to inhibit leaf emergence, and then brown patches develop.

55. There is a heat build-up over these patches, and the few leaves that penetrate may be injured along that portion of the blade that emerges during bright sunlight. This results in differing degrees of injury that appear as green red, and tan bands along the leaves.

56. Clump grasses such as Highlight recover only sparsely in comparison with a variety such as Ruby which has some rhizomes from which new leaves may emerge.



57. Kentucky bluegrasses have shown consistent differences in seed stalk production. Newport produces many seed stalks each year despite maintaining dense cover as most varieties of bluegrass do on productive sites under no-mow management. Kenblue typifies long leaved types that produce few seed stalks.

58. Kenblue also breaks dormancy faster in the spring than does Newport. Merion Kentucky bluegrass, and most of the fine-turf types are also relatively dormant in the spring under this type management.

59. The perennial ryegrasses show great vigor soon after seeding. Linn attains a height of 16" before heading for the first time, in comparison with 9" for Manhattan. Initial soil coverage is more than adequate.

60. The following season, under minimum maintenance, the ryegrasses are most notable for their seed stalk production, and vegetative growth declines appreciably. Ruby red fescue, maintains an attractive vegetative cover, and appears greener than K-31 tall fescue.

61. Under poor soil conditions and zero maintenance the fine fescues don't become overly dense and smother. The fine-turf-type Kentucky bluegrasses, on the other hand, don't maintain a satisfactory amount of cover.

62. Pennlawn creeping red fescue maintained better cover than Kenwell tall fescue which is very similar to K-31 tall fescue under these conditions.

63. Kenblue Kentucky bluegrass produced a much better cover than the fine-turf-type bluegrasses, but did not retain color as well as Ruby red fescue.

64. Crownvetch has been widely used on roadside banks, and certainly appears attractive while in bloom. Establishment is slow, however, and coverage is seldom complete the first couple of years.

65. Under most conditions crownvetch eventually produces a thick deep green growth that dominates completely, and excludes the original plant associates, both weeds and grass.

66. Crownvetch loses its green color about the time the soil surface freezes and it stays quite brown (and this is very noticeable in areas with little snow cover) until after most grasses have greened up in the spring.

67. Summer drought may turn crownvetch quite brown also.

68. Crownvetch reportedly "gobbles up garbage" but, of course, the garbage will be hidden only as long as the vegetation stands tall.



69. Fires along roadsides are another serious matter, and are frequently attributed to cigarettes igniting accumulated dry vegetation. We failed to ignite crownvetch, tall fescue, and Kentucky bluegrass under these conditions.

70. Crownvetch, and several grasses burned readily when ignited with a match on the same day they could not be ignited with cigarettes.

71. Erosion from areas of burned crownvetch may be more serious than from grassy areas, for the former doesn't produce the fibrous root system found under grass.

72. What we are striving to develop is a superior grass that will give us maximum green cover, with greatest certainty and minimum maintenance.

73. We believe that superior grass contributed to the concept of "The Complete Highway"; that is, designed for ... utility, safety, economy, and beauty.

---

#### CEMETERY MAINTENANCE

Martin Stolpe, Executive Vice President  
Castle View Burial Park, Inc.  
New Castle, PA.

For the past 15 years I have been Executive Vice President of the Castle View Burial Park, a lawn plan cemetery in New Castle, Pennsylvania.

As President of the Pennsylvania Turfgrass Council I have become personally acquainted with Dr. Fred Grau and Dr. Joseph Duich, and the late Professor H. Burton Musser whose efforts have made the Penn State University's Turfgrass Program as well known as your our here in Massachusetts. So it is a pleasure to be invited to participate in your 1973 Massachusetts Turf Conference.

I'd like to explain the basis on which cemeteries in this country operate and how this affects cemetery maintenance. The need for cemetery merchandise and services is not a case of whether - but when. Taxes can be evaded or avoided - but not death. Cemeteries in the United States customarily make sales once in the lifetime of most families and at a one time price. "Perpetual Care" is included in this price. The plan is that a portion of the price of each sale be set aside in an irrevocable endowment fund whose income will provide the monies for the general maintenance of the cemetery as a whole and the "family plot" in particular - "forever." On such a basis what would you charge for your products and



services? I would say that in the case of a Country Club Membership, on the same basis, not even the most wealthy could afford to belong. Such a basis for operation is obviously bad business. Business exists on sales - future sales; and cemeteries certainly seem designed to eliminate their future sales. However, this system seems to satisfy the wants and needs of our country and has changed very little over the years. It has served well, albeit with problems, for a long time. With this explanation as a start let's take the next look at cemeteries.

Generally there are two types of cemeteries. The Traditional Cemetery with upright monuments with which almost every one is familiar. The second type is the Lawn Plan Cemetery or "Memorial Park", developed in the early '20's and now common throughout the country. Both types of cemeteries have their unique maintenance requirements. However, since people are the basis of society the real difference in cemeteries is the difference in the people operating them. The happy man - vocationally - would work for nothing if he could afford to. Such a description fits most cemeteries I know.

Planning from the beginning, good common-sense planning considering all the facts available, with an eye to the future makes all the difference in the maintenance of any cemetery. Such a statement applies to any piece of ground, possibly the one that you maintain as a park, golf course, estate, etc. Wouldn't it be great if that dumb so-and-so that was there before you hadn't made so many mistakes! Everyone must pay for creative talent and good work. But, how much less do they cost than the alternative poor job. Since cemeteries are the most permanent use devised by mankind for a given piece of ground, the need for good planning, creative talent, and that "good job" done by all concerned is even more than necessary, it's imperative. It's bad enough to suffer for 50 years with a roadway that wasn't built right on your golf course - until the course is sold for a housing development. Imagine a succession of cemetery superintendents having this same problem in a given cemetery - "forever." I'm told that's somewhat the way Hell is supposed to be. Now that I have outlined for you the basis for the operation of cemeteries, what those cemeteries are like, what types of people operate them, and the necessity for quality throughout cemetery operations, let's look at some solutions to cemetery maintenance.

You've all heard of the High Cost of Dying, also the High Cost of Living and the High Cost of Everything. This points up the universal fact that almost everything we do costs money. So it is with the cemetery superintendent. The job he can do is closely related to the money he can spend on that job. There are several ways cemeteries solve this problem. While we consider these, keep in mind that one time sale at that one time price I mentioned earlier.

Sales provide the greatest income for most successful business, and cemeteries are no exception. Pre-arrangement sales are the cemeteries' most effective solution to providing maintenance funds. It makes sense for cemeteries and their customers to complete these arrangements before



the emergency arises. Remember it's not a question of whether - but when! If you make arrangements with your cemetery today, you purchase that one time, at that one time price; that's worth a lot to you. To the cemetery it means they can plan properly, now! beforehand with the money in the bank. This is the only logical excuse for that one time sale at that one time price that I earlier described as a bad business practice. Now it's not bad - it's good common sense. Compare this situation to the owner of a country club that started developing his club in 1960. His basic economic factor depends on when he bought the land - say in 1939 or 1959! The purchase of grave space is not the cemetery's only opportunity to make a sale to you. There are other items such as the memorial for the graves and the interment vault. The same principles apply to these necessary items as to the purchase of the grave spaces. This is also the same for Mausoleum Entombment or Cremation. The merchandise and services may vary but not the need for both the cemetery and the customer to make those pre-arrangements. Of course the cemetery will always have the income from interments as long as people continue to die and the cemetery has some place to put them. However this income from interments is mainly a charge for the labor related to the interment, and the "profit" margin on interment fees is quite small, though necessary.

There are three more obvious solutions to cemetery maintenance, they involve Men, Machines and Innovation. I won't go into these three items because I would just be saying in another way the same things I hear all of you talking about in the hall, the bar, and throughout this hotel. Not to mention what the fine speakers on your program are saying. The same thing applies to ceterierians. I am an active member of the Keystone State Association of Cemeteries and National Association of Cemeteries. They also get together to discuss men, machines, and innovation. In fact when I look at my calendar it seems that's all I do is go to another meeting. I wouldn't go, however, if I didn't learn something new each time. So I encourage you to continue to attend such meetings just as I do ceterierians. Association with others in the same business is an invaluable way to solve maintenance problems - Remember - nothing is so sacred that it is not subject to change!

Although interments take only a small percentage of the cemetery superintendent's time as compared to the rest of his responsibilities, they are the most familiar cemetery work, outside of mowing, to the general public. The interment is an emergency situation. Death always creates an emergency! Last June when Agnes struck this country for a period of approximately three days, literally thousands of interments took place in hundreds of cemeteries during the storm and floods. Imagine the worst weather conditions you have experienced. During that weather cemeteries in your own community were making interments, because when interments occur it's the normal emergency situation in cemeteries. Everyone expects ceterierians to do their job no matter what. This job of making interments requires extra special care too. Digging a grave usually requires a backhoe, a dump truck and often other heavy equipment. No matter that the ground conditions existing at the time keep golf courses, parks, athletic fields, etc., closed to everyone, the burial must be made - it's an emergency! The bereaved family must be served. Ceterierians must be prepared to welcome an entire funeral entourage in all its formal aspects, no matter what! And we never get to pick the location of the



burial. That's either pre-arranged or up to the family at the time. For cemeteries interments are like hosting the U.S. Open on an average of 36 hours notice. It's not hard to see why the planning I mentioned earlier is so imperative. And it's not hard to recognize why every family's experience with the cemetery at the time of interment may not be perfect. Most cemetery operators say something like this to their employees, "Handle each interment no matter what the conditions as though it were your own Mother, Father, or Wife."

Such a philosophy is the best that we have come up with but even this does not always satisfy bereaved families if they feel their expectations have not been met. Every business has to deal with complaints; it's part of the job. The golf course superintendent gets them all the time. Cemetery complaints are unique in that the element of emotion due to the stress of personal loss through death is involved in each complaint. How would you like to handle an irate wife whose husband has recently died? Fortunately most cemetery customers are dealt with to their satisfaction, but there are a few who are not. These people require special attention. Dealt with in perfect honesty and with consideration, their problems can be solved. Most cemetery superintendents I know derive great satisfaction from solving such problems.

Now let's get down to the "nitty gritty" of cemetery maintenance. The cemetery superintendent is in charge of an entire "community." The cemetery develops its own land with roads, sewers, plot plans, everything. It has its own ordinances and police powers. This complete responsibility requires that the superintendent have expertise in a great variety of subjects. All this work requires priorities.

Interments come first since they represent the emergency situation previously mentioned. They require the greatest amount of equipment in order to meet all possible situations. Of course this equipment must be ready for use on short notice. These items include but are not limited to a backhoe, dump truck, 3/4 ton pickup, air compressor, and jack hammer, 150 gal. tank of water and 2 1/2" pump, steel airfield matting, vault-handling device, miscellaneous hand tools and tarps.

Mowing is usually second and requires special care too. The cemetery superintendent mows with a multitude of obstructions to be considered, all of which may not be damaged, and many of them present a hazard to the mower and a danger to the operator. Cemetery personnel often mow during wet weather since the job must be done when it needs to be done. Not when it is convenient. The cemetery superintendent cannot be sure that when the grass dries out he won't be occupied with interments which take first priority.

The care of the graves comes third. Graves must be filled when they settle and seeded or sodded as soon as the settling is reasonably complete. Keeping the ground level is one of the biggest jobs a cemetery superintendent has. Without level ground, mowing becomes even more of a problem and thus the appearance of the turf is poor. This is the one key factor common to all cemeteries; the care and leveling of graves.



The interment vaults mentioned earlier are required by most cemeteries to prevent the eventual cave-in of graves if permanent support is not used. At my cemetery we usually put 150 gallons of water in the grave as we backfill to speed up the settling process. However, depending on soil and weather conditions graves may not settle completely for several years. This means constant attention is necessary. One of the ways to measure the quality of a cemetery is by observing this aspect of maintenance.

The installation and care of memorials comes fourth. The greatest long term problem faced here is trimming. Most efficiency-minded superintendents use chemical means of trimming that will reduce the job to a once-a-year treatment rather than regular mechanical trimmings throughout the growing season. Memorials must be kept level and straight so they are in this sense closely related to keeping graves filled and level.

Finally comes the care of roads, features, buildings and all the things you do where you work. The job is a big one and much is expected of the cemetery superintendent. At best the level of maintenance he can provide does not meet with that of the golf course, athletic field, or other turf areas that you maintain. The public compares cemeteries with these areas, usually at Memorial Day time which always comes too early for most cemeteries north of the Mason-Dixon Line. The problems and challenges I have enumerated for you in this brief time are the reasons the cemetery superintendent has a job. Unlike yours his job will go on forever and that's how long he needs to achieve the perfection expected of him.

-----

#### KEEPING RECORDS

Al Barauskas, General Manager  
Avalon and Avalon Lakes Golf Courses  
Warren, Ohio

Were you aware that you can do something about the whether?.....  
Weather has always been a popular topic of conversation and it probably will remain so until control of the elements is a matter of routine.

Now to a golf course superintendent the weather is not just a topic of conversation, but his master, his servant, or his downfall. We cannot control the weather at this time, but thanks to radar, weather satellites and the Weather Bureau in general, we can receive timely information relative to climatic conditions. We must build our daily turf management routines on this information, and marshal our labor forces and equipment to accomplish what has to be done within the time allotted us.

So our plans are laid out, the men are ready, the materials are provided, and off we go on to the golf course with a variety of tools and



equipment designed to minimize the time factor in competing with the elements ..... (and the creditors) by accomplishing turf management procedures in the shortest time possible.

All will go well if you can depend on the "whether." No, not the weather as it relates to climatic conditions, but the whether -- W-H-E-A-T-H-E-R, whether your equipment will start, whether it will operate long enough to complete the task. It is this whether that we can and must do something about!

The key lies in an effective preventive maintenance program. In order to produce excellent turf conditions within limited budgets and soaring labor costs, the reliance on time and labor-saving machines continues to grow.

As your equipment inventories expand, so does the need for an effective preventive maintenance program and a record system.

We at Avalon have initiated such a program. Though this 36-hole golf course is maintained with equipment whose cost exceeds a quarter of a million dollars, the need for a preventive maintenance system is applicable to all golf courses regardless of the amount of equipment they may own.

Having equipment ready when it is needed is very important to the golf course superintendent, because it contributes to the producing and maintaining of a well-groomed golf course. In addition, the saving of dollars realized by the reduction of the total cost in maintaining a golf course must always be uppermost in the superintendent's mind. He should always remember that every \$10.00 saved by more efficient maintenance or repairs to his equipment, is the equivalent of \$100.00 collected in green fees. (For this \$10.00 is essentially converted into profit versus \$100.00 of gross income required to achieve the same.)

In a discussion between Alexander Radko of the USGA Green Section and our Green Committee Chairman Mr. Radko mentioned that the Green Section had tried on many occasions to determine the average cost for mowing 1,000 square feet of green putting surface, the cost of raking 1,000 square feet of sand, or the cost of mowing one acre of fairway. Actually, it was this initial contact with Mr. Radko that encouraged us on the quality of our system of records. This system will not only answer those questions, but also you can determine the cost of maintaining your green by individual process, or all of the processes ranging from mowing to changing cups, from spraying to fertilizing, or any and all other functions that you may feel important to your overall golf course management and cost accounting.

And the facts and figures will be your figures for your golf course. Mr. Radko was not seeking this information just to make conversation, but because he realized that in order to alleviate the high cost relative to



golf course operation, you must stretch your budget dollar. By keeping records you can justify the expenditures you are making, but should the inevitable budget cuts occur, you have the information at hand to show the committee how the proposed cut in funds will affect your operation in terms of trees not trimmed, drainage trenches not dug, water systems not repaired, and labor-saving equipment not purchased.

The Record System. The smooth operation of any maintenance system depends upon the understanding and completion of certain forms and records, plus the availability of all pertinent operator, maintenance and parts manuals. These forms, records and maintenance manuals provide uniform procedures for the control, operation and maintenance of equipment. In addition, it also provides a means for gathering cost data to justify expenditures, as well as to evaluate equipment. (This is precisely the information that the green committee and board of trustees want to know.)

Though your golf course may have a variety of equipment, the system followed at the Avalon Golf Course can be used for all equipment, regardless of the variety or the amount.

The information required by these forms is provided by the operator and the mechanic. This recorded information is then analyzed by the green superintendent, who recapitulates certain entries to condense data for committee budget and progress meetings. These records also provide a consolidated daily record of all items of equipment used in each of the turf management and golf course maintenance areas.

Interestingly enough, although the system consists of five basic forms, the majority of the key information is provided by the operator and the mechanic. This information, that takes just a few minutes to record, will provide pieces to a large picture puzzle - a picture of your operation that is completed at the end of one season or annual cycle.

The operator's daily operation and maintenance log - The foundation of the entire record and maintenance system. It is here that we deal with the most important and critical element of any maintenance program... the operator and his equipment. (slide #1)

It is here that the superintendent can check for work progress and problem areas. He can tell whether the employee was or was not working efficiently. He can also see if the mechanics have responded to the mechanical difficulties noted. It assigns direct responsibility for your equipment to the operator and minimized unreported maintenance problems. If used properly, it will assist you greatly in doing something about the "whether" - whether you will be ready to go when conditions warrant.

The employee's daily log is the only form that requires explanation to the employee. Actually, there is only one column that requires any real explanation, and that is the "Job Code" column. In order to



identify a specific job, a job code number has been assigned. A four digit number is used. The first two digits are assigned to specific areas. We have assigned numbers in order of priorities and frequency of use. Example. The name of the golf game is "greens" so the area of greens has been assigned "01". The process performed with the great frequency is mowing, cutting or trimming, so this process has also been assigned "01". The combination of both numbers makes up the job code.

0101 denotes that the greens have been mowed; 0103 -changing cups on the green; 0105 -watering greens. The system is best understood by looking at the job identification list. (slide #2). The job code identification list is posted in an area that the employees use for recording all work performed. (slide #3).

To give the system additional flexibility, a double "00" is provided so the employee may add in the "Remarks" column any area or process not listed. This enables the superintendent to add, if he deems necessary, this new process or area noted. We have found that approximately 25% of our labor hours will fall in the first 10 lines of the job code list. (off slide #3).

The mechanic who makes the needed repairs or adjustments adds his "OK" in the same "Remarks" column where the operator recorded his complaint.

With the exception of the employee's dairy operation and maintenance form, the remaining four forms deal with just two columns. The monthly labor and the annual labor utilization forms deal with job numbers and total hours of labor. The monthly equipment, and the annual equipment utilization forms, deal with equipment number and total hours of equipment operation.

The annual forms are the simplest to complete and the most indicative of your overall golf course operation. You can tell at a glance when you have fertilized or sprayed, watered or aerified, together with a man hour figure that tells you the cost of any specific operation, or the equipment used in performing these tasks. Beginning with the daily log, we shall now see how these forms are utilized. (slides of all forms 4,5,6,7,8).

The preventive maintenance requirements are geared to this information gathered from these forms. This data that indicated the total hours of operation for each item of equipment enables the superintendent to forecast engine overhaul requirements and specific scheduled maintenance, as well as your projected equipment replacement program.

It also enables you to review items of equipment that have not been used to determine if the lack of hours was due to lengthy down-time or because of an inferior product or a change of requirements.

Those items that show a high usage factor may warrant the purchase



of a more efficient machine that may pay for itself due to less man-hours utilized in accomplishing the same task.

The seasonal needs and usage of specific equipment are apparent, and this information is used to schedule equipment for scheduled maintenance, and also when these items can be serviced for storage to prevent deterioration because of idle equipment. The frequency of use determines the frequency and type of service your equipment should receive (off slide #6).

The annual labor utilization, together with the annual equipment forms, provide a composite picture record of your complete operation. It is a tool that you can use to convince your green committee in any area where they may need convincing. Our records were the basis for the purchase of a new sand trap rake, and with the passing of one season, our records show that the cost of the machine was more than paid for by the man-hour reduction in this area of operation.

We must constantly evaluate our over-all operation and the effectiveness of the equipment we use in golf course maintenance .... for today's newest design is tomorrow's obsolescence.

By reviewing your equipment records you will find that a great deal of your special equipment will fall into the category of "seldom used." Your records, together with your turf management requirements, will help you decide if ownership is really economical. (Sometimes rental cost of equipment is less than the interest cost of the funds required to make purchases of certain specialized, seldom-used equipment.) Though labor saving equipment is important, the total labor costs will continue to be the primary indicator of a successfully managed business.

In order to control operational costs the golf course superintendent must supervise his employees efficiently, and monitor his over-all operation constantly. A preventive maintenance system and a record system (other than those notes on pads provided by your friendly salesman) are a must!

As a rope is made strong by weaving and intertwining a series of individual strands, so the weaving and intertwining of your preventive maintenance, record system, and personal supervision, gives your overall operation strength and efficiency, and also assists you in doing something about the "whether".



# AVALON LAKES Golf Course

Date JUNE 7, 1972

WEATHER Sunny 50° - 80°  
52 % Rel. Humidity

SLIDE # 1  
-A-58a-



AVALON GOLF INC.

<u>JOB AREAS</u>		<u>NO. PROCESSES</u>	
01-	GREENS	01-	MOWING-CUTTING-TRIMMING
02-	TEES & COLLARS	02-	CHANGING "T" MARKERS-TRASH CANS-TOWELS
03-	FAIRWAYS	03-	BALL WASHERS
04-	ROUGHES	04-	CHANGING CUPS
05-	SAND TRAPS	04-	RAKING
06-	DRIVING RANGE	05-	WATERING
07-	PICNIC GROUNDS	06-	APPLYING FUNGICIDES
08-	CLUB HOUSE	07-	APPLYING HERBICIDES
09-	CLUB HOUSE LAWN & PARKING LOT	08-	APPLYING INSECTICIDES
10-	MAINTENANCE BUILDING	09-	FERTILIZING
11-	AVALON INN, LAWN & PARKING LOT	10-	GENERAL SHOP WORK
12-	CART BUILDING	11-	REPAIR OF EQUIPMENT
13-	CART PATHS	12-	PM OF EQUIPMENT
14-	TREES, ORNAMENTALS	13-	CLEAN UP
15-	LAKES	14-	PAINTING
16-	IRRIGATION SYSTEM	15-	WEED CONTROL
17-	DRAINAGE SYSTEM	16-	EDGING
18-	SHELTER HOUSES	17-	LEAF REMOVAL
19-	PUBLIC RELATIONS PROJECT	18-	SEEDING
20-	CARTS	19-	SODDING
21-	TOURNMENT SPECIAL	20-	AERIFYING
22-	TENNIS COURT AREA	21-	VERTI-GROOVING
23-	BRIDGES	22-	VERTI-CUTTING
24-	GENERAL OFFICE - 37th HOLE	23-	TOP DRESSING
25-	PRO SHOP - AVALON INN	24-	DRAGGING
26-	WOODLANDS	25-	BLOWING
27-	STANDARD GOLF COURSE EQUIPMENT	26-	CLEAN UP MOWING
28-	BAG ROOM	27-	LIMING
29-		28-	SPIKING
30-	APRONS & "T" BANKS	29-	SWEEPING
31-	RECORDS	30-	MISCELLANEOUS LABOR
32-	PAYROLL	31-	ADMINISTRATIVE
33-		32-	HAULING
34-		33-	CAPITAL IMPROVEMENT
35-		34-	STEAM CLEANING
36-		35-	SNOW REMOVAL
37-		36-	SHARPENING
38-		37-	BALL RETREIVING
39-		38-	GENERAL SUPERVISION
40-		39-	PARTS RUN
41-		40-	TRENCHING
42-		41-	ROLLING
43-		42-	DISKING
44-		43-	CULTIVATING
45-		44-	TRANSPLANTING
46-		45-	WELDING
47-		46-	SOIL SHREDDING
48-		47-	MEETINGS
49-		48-	LOADING
50-		49-	JOB TRAINING
51-		50-	COURSE INSPECTION
00-	AREAS NOT COVERED	51-	APPLYING WETTING AGENTS
	(DESCRIBE IN REMARKS COLUMN)	00-	AREAS NOT COVERED
			(DESCRIBE IN REMARKS COLUMN)
		*	AWAITING ASSIGNMENT
		**	EQUIPMENT BREAKDOWN

SLIDE # 2

NOTE: SLIDE # 3 omitted (Slide #3 picture of personnel by time clock)

-A-58b-



EMPLOYEE'S DAILY OPERATION AND MAINTENANCE LOG

AVALON LAKES Golf Course

Date June 7, 1972

INSPECT EQUIPMENT PRIOR TO USE

WEATHER Sunny 50° - 80°  
52% Rel. Humidity

EMPLOYEE	Equipment Number	Job Number	Hours		Fuel Oil	Remarks Repairs Required
			Labor	Equipment		
ULP	A-17	02-01	3	2 1/2	2gal.	OK
B.11	A-18	01-01	3	3	2gal.	OK
Tom	A-19	01-01	3	2 1/2	2gal.	Hyd. LEAK (OK RT. MOWER (JOB P.)
BONEG	<del>A-24</del> A-40	01-06	5	4 1/2	10gal.	OK - Back 9
BART	A-250					
ULP	A-80	01-05	2	1 1/2	2gal.	1-3-5 GREEN
John	<del>A-25</del> A-48	03-01	6	5	10gal.	L. Wing Reel Hit Stone
John	<del>A-25</del> A-48	04-01	10 1/2	9 1/2	10gal.	OK
ZEKE	A-110	11-01	2	1 1/2	1gal.	OK
JOE	-	10-10	2			
JOE	-	10-11	3			
JOE	-	10-12	3			
DEAN	-	19-00	9			SUPERVISED ATHLETIC FIELD CONSTR. FOR Church
AL	-	31-31	2			
AL	-	20-11	6			
Daily Total			59 1/2		39gal.	

SERVICE EQUIPMENT PRIOR TO SECURING

REPORT ALL DISCREPANCIES NOTED



## Avalon LAKES GOLF COURSE

Monthly Labor Utilization Record

MONTH JUNE 1972

Job Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total Hours	
01-01	5	7	5	4	11	4	6	8	7	7	6		7	7	3	6	9	5	6	5	6	12	3	5		6	3		6	6		165	
01-05	6	3			3		2	2		12	7		8	2	8					3			4	5						10		75	
01-06					10	6	5										11			4		6	9									51	
02-01	9			2	9		3	2	4			15			17		8	7		11			3				9					110	
03-01	7	2			7		6							9				4		4		7			5			7		3		61	
04-01		9	13	6	10	4	10	7	11			13			8				5			3½	4			4				2		110	
10-10	4	4	3	4	3	2	2		3		4		6		5		5		6		5		5		5		5		4	5		80	
10-11	11	12	11	8	11	5	3		11		10			6		16	20	14	11	10		12	8			8	5		10	9		211	
10-12		1			2		3																	2			3		2			13	
11-01				6			2				3		1					4					1	3					3			23	
19-00							9																										9
20-11							6				4						4						8					6					28

-A-58d-

Daily  
Totals

SLIDE #5



## AVALON AND AVALON LAKES GOLF COURSES

## ANNUAL LABOR UTILIZATION RECORD

1972

Job Number	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	Total Hours	
													Avalon	Lakes
01-01		96	186	199	195	206	111½	50½	7				1051	
	20	86	148	165	175	162	196½	89½	5½					1047½
01-05			28	62	110	97								
			84	75	75	110								
01-06		26	26	12	32	16								
		20	38	51	57	32								
02-01		49	100	108	95	89								
		48	78	110	96	97								
03-01		19	102	85	93	41								
		17	63	61	48	36								
04-01	4	20	138	139	149	80								
		3	175	110	113	86								
11-01		40	65	72	25	52								
	100	110	50	20	30	70								
10-10	140	150	72	60	100	60								
	25	30	70	90	110	115								
10-11	27	32	80	111	200	160								
	7	5	10	11	10	12								
10-12	11	5	10	13	12	14								

-A-58e-



## AVALON LAKES GOLF COURSE

## Monthly Equipment Utilization Record

MONTH JUNE 1972

Equipment Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	total hours
A-17	5			3	8		2	0	4	8				10			4	1 1/2	4			9				6			9			84
A-18	4	4	2	2	11	4	3	2	4	3	9		3	2	1	3	7	3	3	3	6	3	3	2		3	3		3	3		99
A-19	2	3	3	3			2	1	3	4	2		4	3	5	3	3	3	2	5	1	1	2		3	3		2	3			67 1/2
A-21					3	5			8			3		3			12	3				3	4		3			4				51
A-24		2			12	4	1 1/2	3	3	6	11	4	5	6			3						1 1/2		3	5				4		83
A-25					7	9 1/2		3		11	5									1	3	7 1/2			9	4			3	4		67
A-40					4 1/2	4 1/2											6			3	3		4		4	3				4		36
A-43		4 1/2	4				9 1/2				4													4								26
A-80	2	8	4				1 1/2		3		2 1/2				1		2							1								25
A-110		2	6	2	1 1/2	1 1/2			3			2			2		1			1		3	2					1	4			32
A-250					10	6	2 1/2						11							4		6			5					1 1/2		46







## PLANNING CAPITAL EXPENDITURES

Sherwood A. Moore, Superintendent  
Woodway Country Club  
Darien, Conn.

What is Capital Expenditure? And why should we have separate budgets on the golf course for operating expenditures, other club facilities expenditures, capital expenditures, clubhouse expenditures, etc., etc.?

Webster's dictionary says, "Capital expenditure is money spent or debts incurred for additions and betterments." So, on a golf course we should have a capital expenditures budget for money spent for additions and betterments.

Along with the purpose of spending money for additions and betterments, the other reasons for a capital expenditures budget are: (1) to spread out the payments for equipment, improvements, construction, and projects over a period of years; (2) to take advantage of the excise tax break on new construction and improvements and (3) let's admit it - to make your operating budget look better. (This will be evident as we progress into this "Planning Capital Expenditures." )

It was not until the last twelve years or so that I really became involved into planning for capital expenditures. My procedure prior to this was to present to the Greens Committee and Finance Committee an operating budget for the golf course for the fiscal year which included salaries and wages for supervision and labor plus taxes, fringe benefits, and other labor relations; all golf course material and supplies; repairs and miscellaneous items; plus new equipment. This was the extent of our budget. If we wanted to undertake any program on the golf course, a separate report would be presented requesting money for the project. Then as we progressed during the year and wished to undertake another project a separate and entirely new report would be presented for this project. And so on.

This practice was changed when one of the outstanding chairmen that I had while at Winged Foot came to me at budget time with the suggestion that when we prepared the operating budget for the year to also prepare a budget for new equipment and all projects that we thought were important and that we could undertake that year. With such a plan it would not be necessary to go back to the board every month or so requesting additional funds; you will have all projects before them at one time (and they can approve or disapprove of any or all of them); and as all budgets will be presented at one time they will have a better idea of the allocations of funds, for they will have a fairly good idea of what the income for the year will be. Actually you will have a better chance of receiving a fairer share of monies appropriated. And so was born our capital expenditures.

This budgeting and planning and programming has even grown to a greater



extent at Woodway. Each year I now prepare three budgets: (1) an operating budget; (2) other club facilities budget; and (3) a capital expenditures budget.

Our Operating Budget includes everything pertaining to the operation and maintenance of the golf course -- supervision, labor, taxes, fringe benefits, materials and supplies, outside labor and equipment rental, repairs, electricity, fuel, etc. Except taxes and fringe benefits, it includes only those items that the greens department has a direct control over. Tournament expenses, pro shop wages and meals, score cards, etc., are handled in a separate budget.

Other Club Facilities Budget includes those facilities other than golf that are available to the membership at Woodway and to which the greens department is involved, such as: tennis courts, paddle tennis courts, swimming pool, gun club, beach club, and clubhouse which includes not only the grounds but the repairs and painting that our crew can take care of. Also included in this budget is the cost of maintaining three houses on the property owned by the club. As you can imagine, there is some overlapping in this budget with that of the club manager, but fortunately there is no friction here for we work very harmoniously as a team. Under each category in this budget I itemize the labor and material that we anticipate for the season. Thus, each facility can show its cost of operation as pertaining to the greens department.

Now you must plan the Capital Expenditures Budget. To do this there are two very important factors, or maybe I should say three.

You must know and understand the philosophy of the club and you must have a program. Without either of these, you are dead. Oh yes, the third! You must also know about yourself. Are you motivated? Are you willing to initiate programs and projects, and undertake them, and supervise them? Do you have a love for the golf course and a desire to see it improve? Or are you just satisfied to grow grass until your retirement? This capital budgeting can depend on what you want to do.

Fortunately, I have never been at a club where their philosophy has not been for addition or betterment. They all wanted their course to be "the garden spot of the East." So we have capital expenditures. There is always room for improvement and most members take great pride in their club and golf course. Whether the golf course is only a few years old or over fifty years old, there is always something that can be improved on. The only exception that I know of is that golf course in Maine where Senator Saltonstall told us in Boston that he was a member of and their annual budget is \$3000.00. Well, it might be a little difficult to get money for capital expenditures at that club! (I wonder what the Superintendent's salary is there?) One has only to think of a single word that has been in the foreground these past two years which automatically means "capital expenditures." And that word is "Drainage."



Seriously, most club's philosophy is for betterment and improvement and they are willing to spend some money to obtain this goal. All they need is a program!

At the Management Seminar in Hartford we were told that the four functions of managing - and this is related to accounting - are: (1) Planning, (2) Organizing, (3) Directing, and (4) Controlling. We are going to be mainly concerned with the first function - planning.

### Planning Capital Expenditures

You know yourself that to be a successful superintendent, you must have a planned program. Granted that factors such as weather, labor, equipment, etc., will influence, alter and change your program, but you initially must have a program. You have a program of mowing, fertilizing, watering, spraying, etc., and so you must have a program for planning the capital expenditures.

I like to think of capital expenditures as non-reoccurring projects - they are not part of your overall maintenance program. Some of the projects that we have capitalized over the past several years are: water systems, drainage, bridges, service roads, pump house, traps, warming house, maintenance building, etc.

Naturally some of these items will reoccur in the budget for a few years, or maybe even several years, depending on your planning. In many instances it would be impossible to initiate a project without a long-range plan or program. I am a firm believer in long-range planning.

Many programs are turned down because a club cannot afford the cost in one year, but if presented to them on a long-range basis where the costs are spread out over a period of years it would be readily accepted. Such is the case of automatic watering systems. It is quite difficult to convince a club to spend \$60,000 to \$100,000, or even more, in one season to convert your present water system to automation (especially when they see those snap valves every 80' in the fairways), but when budgeted in a four to six year program and presented with sound reasoning it is much easier to digest. Drainage would be another long-range reoccurring item in your capital expenditures budget, along with paving of golf cart paths, bridges, and possibly a tree planting program.

Recently I was walking over a golf course with a fellow superintendent and we were discussing various problems and I casually mentioned that the club should undertake this or that project. His remark was, "You kidding? This Club won't go for beans." And it was even more surprising because there before us on the golf course was a contractor with heavy equipment doing a \$15,000 drainage project. He did not even present them a capital expenditures budget for them to refuse. In fact, after having a beautiful capital expenditures budget in 1971 of \$140,000, my 1972 budget was cut down from \$87,000 to \$53,000.



and this year's capital expenditures budget is \$45,000, reduced from the original presentation of \$80,000. We still are going to have plenty to do though if we accomplish all that we plan to do.

One of the big items that I include in our capital expenditures budget is the purchase of equipment. And this does require some planning. Not only do we have a complete inventory of all equipment, tools and supplies, but I also have an additional list of all major pieces of equipment tabulated according to the year purchased, the cost, the anticipated year of replacement, and the approximate cost of replacement. Naturally the last column is truly a guessestimate, with the way inflation is going, and especially if you plan not to replace a piece of equipment for a long time. This list has increased over the years due to new equipment arriving on the scene; the increase in cost of some pieces of equipment that were normally "sneaked" in, and naturally the greater amount of equipment used on golf courses these days.

Your inventory adds up to quite a tidy sum, so you must budget a minimum of \$10,000 to \$15,000 yearly on new equipment just for replacement. This would require ten years or more for complete replacement, and what about those many items that you write off in five to seven years? And what about entirely new pieces of equipment that arrive on the market such as the trap rakes and triplex mowers that have in the past few years? And what about when the state comes around with a no-burning ban and you have to purchase a chipper to devour that mountain of brush?

In purchasing equipment do not overdo or underdo. Look ahead and plan it out, and consider all factors. In planning your Capital Expenditures Budget plan a fair share of equipment --make that your first item in your budget.

Then are you planning to pave some of your golf cart paths this Year? If so, just where are they going to be? How long are they going to be? How wide? Will you contract the job out? Or will you prepare the surface and just contract the paving? Or will you undertake the entire job yourself? If you are going to contract it out, get firm prices from two or more contractors figuring on the same specifications, and making sure that they are quoting for completion of the work at a specific time. Then you will have some accurate figures for your budget. If you are going to do the work yourself -partial or complete - include the labor and materials for each individual path. You can estimate the labor required to remove topsoil, add gravel or stone, the paving, and the clean-up that follows. This is especially simplified if records have been kept on previous jobs.

The same procedure can be used with drainage. If contracted out, then the contract price. If you use your own crew, then the labor involved in removing sod, digging, grading, laying tile, covering with stone, back-filling, grading, sodding, and cleaning up. This labor, along with materials, should be included in the capital expenditures budget. And so we could go on with all of the various projects that we have planned or programmed for the season.



If you do not have extra help for these projects but use your own crew during slack periods or when time allows, then the labor involved in these projects for that period of time should be charged to capital expenditures along with the appropriate taxes, and the Operating Budget should be credited with this amount.

A good example is our trap program. The traps at Woodway had deteriorated over the years to the point where they were horrible. Soil and sand were mixed together to the point that they compacted readily, and along with numerous pebbles and stones gave justification to the numerous complaints. So we decided to renovate the traps over a period of two years by removing all existing sand, contouring the slopes if necessary, and naturally replacing with clean sharp sand. Our largest problem was to get the committee to agree what sand to use. But that was soon resolved when the chairman and I decided between ourselves which sand to use! All traps were measured and the number of yards of sand needed was determined. I made a trial run of removing sand from a few traps before determining the amount of labor required. So we budgeted \$10,000 for the project --\$6,000 for the sand, \$4,000 for the labor; and when we finished the project we were within a few dollars of the budget figure.

We are now in the process of automating our present watering system and are doing this on a four year program with our own crew and equipment. Each year under Capital Expenditures we budget so much for labor and materials. The first year we included also a trenching machine for \$2,600 under this category in the budget and not under new equipment.

And so we could go on and on, but why be repetitious. At the Management Seminar they told us that reports should have weight in ideas, not in paper. So I hope that this report has given you some ideas.

In summary, we can say, "In planning your capital expenditures have a program."

-----



BRITISH GOLF COURSE ARCHITECTURE  
HISTORICAL INFLUENCES - CURRENT TRENDS

F.W. Hawtree (B.A. Oxon.)  
Golf Course Architect  
Addington, Croydon, England

Mr. Geoffrey Cornish and I are going to speak about two schools of golf architecture. Yet it is only a hundred years since golf course architects were, so to speak, doing their first sketches of buffaloes in charcoal on the walls of their caves. We have passed from the Primitive to the Picturesque in less than a century.

It is no accident that I stop at the Picturesque. In Britain, this was the period in landscape architecture in the late 18th and early 19th centuries when the formal devices and rigid lines of classical gardens were swept away by men like Capability Brown, and Repton. Like most reactions, this one went too far and the pedantic imitation of Nature became an end in itself. Nevertheless, the origins and essentials of the movement persist in the modern approach to golf course design - the taming of wild Nature - the abhorrence of the straight line - the collective effect from scattered units. This style, (I record without chauvinism), is still referred to in France as "le jardin anglais".

Before linking it to the development of golf course design in Britain, three related factors need mention. Firstly, one perennial problem of adapting land for golf is sometimes forgotten. The design elements available to the golf course architect are very few. His full range comprises Grass - Contour - Sand - Water - Planting. Even if the potential uses of these basic materials are infinite - and their emphasis, proportions and pattern, inexhaustible - the designer for golf soon comes up against a limit which he cannot pass. This limit, however, imposes a stern discipline. In another sense, it also simplifies his task by restricting the area in which he can work fruitfully.

Secondly, it is proper that a game springing, as some think, from the dark, dour side of the Scottish character, should itself impose a corresponding discipline on its designers as well as its devotees. Some earlier beliefs of what constituted the best competitive golf have changed but the pattern required in the golf course still largely corresponds to the tensions, reliefs and excitements implicit in a round of eighteen holes.

For the third factor we need only look at a map. The sea is never far away in these small islands. The traditional golfing scene has therefore always been close to the minds of British designers and provided an aesthetic which cannot be assailed since it is derived from the essence of the game. It is still very dear to the hearts of our administrators and leading amateur golfers.

Traditional links land was at first the only sensible place on which to play this game. Before the invention of Mr. Budding's first cylinder



mower, sandy soil, slow growing fescues, further retarded by salt breezes and rabbits, provided the only approximation to reasonable playing conditions. The earliest golf at Leith in Edinburgh in 1744 was played under such conditions though not, as one might have thought, from hole to hole but from pub to pub, a distance of 9 miles - a true championship course. But these links tended to become soft and boggy and their Rules (1744) allowed for teeing up if the ball came into wet areas while at St. Andrews (1754) the ground was firmer, drier, and the player could only lift and drop.

The Honourable Company of Edinburgh Golfers played a considerable part in the Royal and Ancient Club and themselves re-formed on links at Musselburgh in 1836 before settling at Muirfield in 1891. Perhaps if the Leith Links had been drier, the home of golf might have been situated elsewhere but St. Andrews has survived as the prototype, in spite of being unique.

This was the era of golf's first great expansion. In 1888 there were 73 golf courses in Scotland, 57 in England, 6 in Ireland and 2 in Wales; by 1897 there were hundreds.

The first links in England were at Westward Ho! in Devon (1864) and Hoylake (1869); but it was with the move inland that the history of British golf course design begins.

Firstly, we must recognise that the players' attitude was notably different to today. One or two quotations from the first Golfing Annual (1887-88) will show us why.

Kelso Golf Club "Play can only be engaged in during the winter and spring months as the long ripe grass which covers the course during the rest of the year makes golf impossible."

Bath Golf Club "It is an undulating course intersected by a long deep quarry which forms the principal hazard and has become the tomb of many balls."

Buxton "The hazards are stone walls, deep quarries and bunkers where quarries had formerly existed."

Buckie "The first hole is played from an eminence sixty feet above the level of the first hole, and between it and the hole there is a deep and most hazardous gully. Woe betide the luckless player who "tops" his ball here. It may cost him 10 strokes when the hole should be taken in 3 or 4."

There was a high sense of adventure in those days which subsequent designers have had to curb except where natural feature provides it ready made.

To what extent these fierce hazards, expensive in golf balls, were engineered by the designers is not clear but it is certain that



the professional golfers of the time were those most frequently consulted in the layout of the golf course.

This task was probably no more than a matter of a day's work and involved a simple setting out of the holes. Putting areas were prepared where levels demanded them but were of the formal "gun platform" style which can still be seen on some downland courses in Sussex. The seaside influence was entirely absent from detailed design though the spirit of adventure came inland quite readily. Oddly enough, these two aspects of seaside influence have now largely exchanged their roles. Today, detailed design harks back to the links but the spirit of high adventure has to be presented in milder forms with simpler alternatives if a lengthy discussion of the philosophy of design, fairness, and life generally is to be avoided.

Of those old professional golfers, Tom Morris, the brothers Dunn, Willy Park were outstanding. Willy Park worked on the first course at Sunningdale. Tom Dunn became well known for his site appreciations which normally ran, "God obviously intended this land for a golf course." From the results, God also had something to learn about detail at that time. But, until large scale earth movement became feasible, no golf architect was better than the land he had to work with. Some were still much better than others but the best was still to come and probably Willy Park more than any other pointed the way.

One of the first men to codify the principles which still animate golf course design was J.L. Lowe, a member of The Royal and Ancient. Chapter 9 of his book "Concerning Golf"\* contains a variety of notable sayings:-

".....Golf need not be played in bee-lines."

"There seems to me to be far too few 'round the corner' holes in golf."

"Golf at its best should be a contest of risks."

"Bunkers, if they be good bunkers, and bunkers of strong character refuse to be disregarded..... they do not mind being avoided, but they decline to be disregarded."

"The first point therefore we demand in a short hole is that it should be short...."

At the end of the chapter, his enthusiasm gets the better of him:-

"The heart of golf has in propelling the ball accurately from one situation to another. Each step in the journey should be hazardous; the links should be almost too difficult for the player; bunkers should more perfectly abound."

Professional golfers by no means left the architectural scene (any more than they have today) and James Braid and J.H. Taylor followed Willy

\*(Hodder & Stoughton, London 1903).



Park as consultants, though gradually constructional firms began to grow up which became associated with one professional so that his general indications were interpreted by experienced foremen.

But now there also appeared gifted amateur designers, not yet persons trained specifically for the job but coming to it out of enthusiasm.

H.S. Colt, a master of layout, was initially secretary at Sunningdale and finished off Willy Park's early work there. He was responsible for the Eden at St. Andrews (1914). Moor Park, Wentworth, Berkshire and Swinley Forest followed in the Twenties all near London and all in their different ways still in the top flight.

Dr. Mackenzie gave up doctoring and became one of the first exporters of golf course design. His work at Augusta National and at Royal Melbourne, whither he went afterwards on the same trip, are still outstanding.

Some of the best work was done by architects whose total output was very low. J.F. Abercromby, Addington; Herbert Fowler, Walton Heath; A.C.M. Croome, Liphook - these men appear to have concentrated on the one job in hand. There is probably no better way of approaching perfection.

For the first time, partnerships also appeared in the twenties. H.S. Colt was joined by C.H. Alison and J.S.F. Morrison; three first World War majors, Sir Guy Campbell, S.V. Hotchkin and C.K. Hutchison teamed up; the West Sussex course at Pulborough was one result - one of those courses about which an unkind word has never been spoken (Blairgowrie, Rosemount, Perthshire is another, made by Braid and Stutt). Tom Simpson gave up the law after considering a bunker in the middle of the 4th fairway at Woking and produced superb courses in Belgium (Spa, Antwerp, Liege) and France (Hardenot, Morfontaine) as well as strongly influencing design in Britain by his personality and writings. My own father also belonged to this period, Royal Birkdale (1931) being his magnum opus.

It is not difficult to conceive that this sudden rash of golf course architects corresponded with a similar rash of new golf courses, even if some did severely limit their activities. In the Twenties indeed, fifty new courses were appearing every year. And the experience which this boom provided for the busiest designers produced at the top a standard of golf course design which persisted right up to the Second World War and on which we have never improved since for sheer playing interest and merit.

After that war, the long hiatus until golf revived, severely limited the number of golf course architects. Mackenzie Ross re-designed Turnberry which tank practice had largely destroyed. (Ross incidentally is first President of the British Association of Golf Course Architects\*).

(\* Founded 1972. Now has 10 members).



Opinion gives high praise for his work on these two courses. Others reconstructed another links course of 27 holes at Prince's, Sandwich but this one has never captured the imagination. It lies alongside the Royal St. George's Links where Open Championships have been held in the past but which now suffers from access problems with a toll bridge and narrow streets in Sandwich itself.

C.H. Alison did a good deal of work in South Africa and set a standard of design which gives a uniform excellence to nearly all the golf courses round Johannesburg.

But generally in the Fifties in the British Isles, there was more talk of smaller bunkers, less bunkers, small greens, smaller ground staffs, than there was of new courses. Curiously enough, this economy led to a great deal of modification of existing layouts. It was as if the absence of new courses produced a desire to change existing ones even if that change was only in the direction of eliminating surplus sand areas. By contrast, the trend has disappeared as new courses have increased.

The small persistent core of professional designers from 1945 to 1960 has now been joined by newcomers, most of whom have been connected with playing the game either as amateurs or professionals, and it is difficult to discern any significant trend. We are still too close to events.

Obviously, American golf course architecture, which got started again much quicker than ours with a panache and style quite unprecedented on our side of the Atlantic, has had, and is still having, a tremendous impact.

Its early emphasis on greater total length did not lead to the happiest results. The formula was applied without discrimination and some boredom resulted. We were fortunately inoculated against bigger greens because those at St. Andrews could scarcely be exceeded anywhere. Bigger tees found favour on practical grounds though, again, the full implications of their landscape effect was not realised at once. The use of water on the grand scale has still to be generally accepted. In our climate, the transport of a large volume of soil about the course from an artificial lake can induce problems of soil structure unless time is less pressing than normally with our short construction season from April to September. Nevertheless, a lot of fresh water has appeared, even on older courses, and the fashion is by no means disagreeable provided it is used with discretion. The penalty is perhaps rather too final for repetitive use in one layout but its landscape value is undeniable.

The influence of maintenance practices on design is also increasingly significant and as the mutual export of machinery increases, it can be expected that our common requirements will draw different styles of design still closer. But if I can predict the future of the British



attitude, it will continue to derive more from the inherent qualities of the site, rather than approach the problem with a pre-conceived notion of what a golf course should look like and impose that pre-conception on the site. Part of this reluctance to change the scenery radically will come from the absence of funds. The association of golf course and new housing is relatively difficult to achieve in the British Isles where the whole pattern of future development is laid down by Development Plans not easy to modify without special procedures. Thus, most new golf courses today are provided by municipalities while only a sprinkling come from private developers or local groups of players.

But apart from finance, I would expect that the old inspiration of links land will continue to exercise its discipline. In Scotland itself, the majority of golf courses are made on extremely simple lines. Even Gleneagles and the great championship courses owe their reputation to the terrain as much as to the skill of those who adapted it. One wonders even if the ultimate aim of good golf course design should not be to provide for match-play or the "Scotch" foursome where the game is as much man versus man as man versus course. Perhaps this predominant popularity of medal play has led to the ironing out of irregularities and the goal of uniform expanses of green sward, scrupulously fair to all. At one of the older British clubs, I still hear the first hole described as "A wonderful 19th hole". At another, a remodelling scheme desirable in every other way foundered on the fact that it would be too far to walk back from the 15th green for matches which finished 4 and 3.

At the same time, I am by no means convinced that the glamour of many of the hallowed links is all derived from the excellence of their design. The atmosphere comes as much from the memory of epic struggles, and even the simplest features become inflated. Most of the 18th holes on British Championship courses appear to have been contrived out of the need to get from the 17th green to the club house; but they have taken on a grandeur which in another situation they could never achieve.

However, Herbert Warren Wind, who normally sounds a very kindly man, said in an article some years back, that we should be having a Golden Age of Golf Course Architecture but actually something less luminous had occurred. If he could say that about the American school, he could certainly repeat it in Britain. The rush of work has not led to outstanding excellence; and its suddenness has led to a dearth of experienced constructional firms. We try to overcome this with detailed working drawings and complete descriptive specifications, but there is still a very real sense in which the golf course architect must work on the ground. My personal hope for British golf course architecture is that it will keep its roots in its native soil rather than be overwhelmed by the exotic. I hope we shall always work on the ground and with the ground. The severe limits on the elements which can be employed in design ought not to lead us to introduce features foreign to the landscape in the hope of being one step ahead of the others. The day I see a palm tree planted at St. Andrews, I shall take up fishing.



## GOLF COURSE ARCHITECTURE IN NORTH AMERICA

Geoffrey S. Cornish  
Golf Course Architect  
Fiddlers Green  
Amherst, Mass.

First I would like to welcome my distinguished colleague, Fred Hawtree, to this side of the ocean. I know it is not his first visit here but I think it is his first opportunity to speak to an American audience. The American Society of Golf Architects is indeed grateful to Dr. Joseph Troll for inviting Mr. Hawtree to our area.

Golf developed in Fred's homeland on the links land of Scotland. Today the game has spread around the globe. The United States which now has 12 million golfers and almost 11,000 courses leads the world in the continuing and apparently limitless expansion of the game. Quoting from Harry Eckhoff of the National Golf Foundation, "Regardless of the type of project - be it a housing development, high rise condominiums or apartments, long range planned mini cities, mobile home sites, ski resorts, hunt clubs, equestrian operations or a summer theatre venture - somewhere in the master plan will be golfing facilities."

Nevertheless in course architecture we must always remember that the only enduring texts on golf design are the renowned and ancient layouts of the British Isles. Furthermore we should constantly recall that until after World War I the majority of course designers on this continent were Scottish born and trained.

Nevertheless there are differences aplenty between British and North American golf course architecture. In any form of design "Form Follows Function." Changes come about thru varying requirements, differing conditions and other pressures. I will endeavor to describe a number of these differences with slides and I am listing hereunder ten differences I would like to outline.

### 1. NUMBER OF COURSES BUILT

Because of sheer numbers of new courses built annually in North America (around 400, or 4 times what is built in all the rest of the world put together), it is not surprising that this huge production influences design. One of the most obvious factors arising from this mass production is the adoption of heavy earth moving equipment to course construction. This in turn has revolutionized golf construction and permitted building of courses on very rough land. It has also meant that larger amounts of fill could be moved. I might add this has not always been in the best interest of the layouts, which might better have fitted into the natural terrain.

In discussing number of courses built it is noteworthy that the majority of new layouts in the U.S. today are those built in conjunction



with housing developments, and satellite or mini-cities. Many of these are under construction with 18 or more holes included. Again we looked to Fred's homeland for the prototype of these satellite cities which contain golf and we find Welwyn Garden City built near London in the early 1920's to be the first example.

## 2. LABOR COSTS

Although labor costs are rising rapidly in Europe they do not approximate North American levels. Therefore our design tends much more to future machine maintenance with the objective of removing all hand labor. As a consequence of this need for streamlined maintenance we find it difficult to produce the interest around the greens that British courses have in dingles, grassy hollows and even furrowed mounds.

## 3. LENGTH

For a number of years the tendency was to lengthen golf layouts in North America so that championship yardage stretched to 7000 yards or more. For the last few years we are revising our thinking more to those of the British with maximum yardage of 6600 to 6800 yards.

## 4. TEES

In order to provide three courses in one our tees tend to be much larger and longer than those on British courses.

## 5. STRATEGIC DESIGN

Nearly all contemporary golf architects favor strategic as contrasted to penal design. Since the concept of strategic design originated with the Scots it is not surprising that our layouts are very similar in this regard to those of Scotland.

## 6. USE OF WATER AS A HAZARD

American golf architects tend to use water much more than our British counterparts. Two reasons for this are our much greater demand for irrigation water and the fact that many of our courses are built in areas where immense quantities of fill are required to raise greens, tees and fairways.

## 7. COMPLETE VISIBILITY

Contemporary design in North America calls for complete visibility from tee to green except on doglegs. We feel that this adds excitement to the game. Furthermore for strategic design to really work it is necessary for the player to be able to plan his strategy as he stands on the tee. In contrast may I remind you of the old course at St. Andrews with its hidden hazards. However, this course is so venerable and



renowned that every true golfer is supposed to know the location of every hazard upon it.

#### 8. GOLF CARTS

The use of these machines is so widespread in North America that we have to actually modify our layouts to accomodate them.

#### 9. CONTEMPORARY GREENS

On this side of the ocean the contemporary green is nearly always raised above fairway level as contrasted to flat fairway type of greens. One of several reasons for this is that the American golfer tends to hit high with wind factors much less pronounced on many of our layouts than they are in Britain.

#### 10. SPEED OF PLAY

Always, too, we must consider speed of play. Despite the golf cars our players average 4 to 6 hours per round as contrasted to 3 1/2 to 4 in Great Britain. This is because players walk fast on the Eastern side of the Atlantic whereas many of our people who perhaps lead more hectic business lives tend to relax on the links. It is noteworthy that although everybody here complains about slowness of play, it is possible that the majority of our golfers, deep down in their souls subconsciously prefer a slow relaxed round.

#### 11. PHILOSOPHY OF GOLF

Golfers in Britain prefer their game to be part skill and part chance. We prefer it to be nearly all skill. Therefore in our design we leave as little as possible to chance. Furthermore the North American superintendent in producing unblemished turf and faultlessly groomed layouts heightens the skill required and negates the chance.

The foregoing are a few instances of differences in golf course design on the two sides of the Ocean. There are many more. Nevertheless as emphasized the game is GOLF, wherever it is played and we continue to look to Fred Hawtree's homeland for inspiration in our design concepts.

-----